9.0 DEVELOPMENT OF CONTROL AND TREATMENT OPTIONS

This section describes the combinations of pollution prevention practices, water conservation practices, and end-of-pipe wastewater treatment that EPA configured as technology options for consideration as bases for the Transportation Equipment Cleaning Industry (TECI) effluent limitations guidelines and standards.

- Best practicable control technology currently available (BPT);
- Best conventional pollutant control technology (BCT);
- Best available technology economically achievable (BAT);
- New source performance standards (NSPS);
- Pretreatment standards for existing sources (PSES); and
- Pretreatment standards for new sources (PSNS).

Technology bases for each option for each regulation were selected from the pollution prevention and wastewater treatment technologies described in Section 8.0. Sections 9.2 through 9.7 discuss the regulatory options that were considered for each of the regulations listed above, including the technology bases and the rationale for developing each option.

9.1 Introduction

The proposed regulations establish quantitative limits on the discharge of pollutants from industrial point sources. The applicability of the various limitations EPA is proposing for the TECI is summarized below:

	Direct Discharge	Indirect Discharge	Existing Source	New Source	Conventional Pollutants	Priority and Nonconventional Pollutants
BPT	✔		✔		✔	✔
BAT	✔		✔			✔
BCT	✔		✔		✔	
NSPS	✔			✔	✔	✔

	Direct Discharge	Indirect Discharge	Existing Source	New Source	Conventional Pollutants	Priority and Nonconventional Pollutants
PSES		✔	✔			✔
PSNS		✔		✔		✔

All of these regulations are based upon the performance of specific technologies but do not require the use of any specific technology. The regulations applicable to direct dischargers are effluent limitations guidelines which are applied to individual facilities through National Pollutant Discharge Elimination System (NPDES) permits issued by EPA or authorized states under Section 402 of the Clean Water Act (CWA). The regulations applicable to indirect dischargers are standards and are administered by local permitting authorities (i.e., the government entity controlling the publicly-owned treatment works (POTW) to which the industrial wastewater is discharged. The pretreatment standards are designed to control pollutants that pass through or interfere with POTWs.

9.1.1 Common Elements of All Options

Technology options for all subcategories have two common elements.

1. <u>Good Heel Removal and Management Practices</u>. The benefits of good heel removal and management practices include the following:

   — Prevent pollutants from entering the wastewater stream (i.e., maximum removal of heel prior to tank cleaning minimizes the pollutant loading in the tank interior cleaning wastewater stream);

   — Provides a potential to recover/reuse valuable product; and

   — May reduce wastewater treatment system capital and annual costs due to reduced wastewater pollutant loadings.

The components of good heel removal and management practices are discussed in detail in Section 8.1.2.

Based on responses to the Detailed Questionnaire, the majority of transportation equipment cleaning (TEC) facilities currently operate good heel removal and management practices. Because of the many benefits of these practices, and a demonstrated trend in the TECI to implement these practices, EPA believes that the TECI will have universally implemented good heel removal and management practices prior to implementation of TECI effluent guidelines. Therefore, EPA is allocating no costs or pollutant reductions for this component of the technology option bases.

2. Good Water Conservation Practices. The benefits of good water conservation practices include the following:

— Reduced water usage and sewage fees;

— Improved wastewater treatment performance and efficiency because influent wastewater pollutant concentrations will be higher; and

— Reduced wastewater treatment system capital and annual operating and maintenance (O&M) costs due to reduced wastewater flows.

The components of good water conservation practices are discussed in detail in Section 8.2.

End-of-pipe wastewater treatment cannot achieve complete removal of pollutants. There is a lowest concentration that wastewater treatment technologies have been demonstrated to achieve. As shown in the equation below, pollutant loadings in wastewater are dependent upon wastewater pollutant concentration and on wastewater flow.

$$PNPL = \frac{C \times PNF}{264,170} \quad (1)$$

where:

PNPL = Production normalized pollutant load, g/tank
C = Concentration, μg/L
PNF = Production normalized flow, gallons/tank

Equation (1) demonstrates that optimal pollutant reductions are achieved using a combination of good water conservation practices and end-of-pipe wastewater treatment.

In developing effluent guidelines limitations and standards for the TECI, the EPA included good water conservation practices as a component of the technology bases for all regulatory options. The Agency considered good water conservation practices to be represented by the median tank interior cleaning wastewater volume discharged per tank cleaning (including non-TEC wastewater streams not easily segregated) for each subcategory. This wastewater volume is referred to as the "regulatory flow" for each subcategory. Table 9-1 at the end of this section presents the subcategory-specific regulatory flows for existing facilities. Development of the subcategory-specific regulatory flows is described in the following subsection.

Since good water conservation practices are defined by the median subcategory flow, 50% of existing TEC facilities currently operate good water conservation practices. For the remaining 50% of TEC facilities, EPA considered a variety of control technologies depending upon the extent of flow reduction required at a given facility to achieve the median subcategory flow. For the truck and rail subcategories, with the exception of hoppers, the control technologies include the following:

- For facilities with current flow to regulatory flow ratios greater than 1 and less than or equal to 1.5:

  - Facility water use monitoring, and
  - Personnel training in water conservation.

- For facilities with current flow to median subcategory flow ratios greater than 1.5 and less than or equal to 2:

  - Facility water use monitoring,
  - Personnel training in water conservation, and
  - Two new spinners and spinner covers.

- For facilities with current flow to median subcategory flow ratios greater than 2:

  — Facility water use monitoring,
  — Personnel training in water conservation, and
  — New tank interior cleaning system(s)[1].

For the hopper subcategories, the control technologies include the following:

- For facilities with current flow to regulatory flow ratios greater than 1:

  — Facility water use monitoring, and
  — Personnel training in water conservation.

For the barge subcategories, the control technologies include the following:

- For facilities with current flow to regulatory flow ratios greater than 1:

  — Facility water use monitoring,
  — Personnel training in water conservation, and
  — Contract hauling of heel.

In calculating compliance cost estimates (see Section 10.0), EPA assumed that the flow reduction technology options are sufficient to achieve the regulatory flow for all facilities based on the selection criteria described above. Additional details concerning EPA's flow reduction methodology, the flow reduction control technologies, and application of the flow technologies are included in the TECI cost model documentation contained in the rulemaking record.

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[1] New tank interior cleaning system(s) include(s) solution tanks, controls, pumps, piping, catwalks, stairways, rails, and spinners.

9.1.2 Development of Subcategory-Specific Regulatory Flows

Waste streams considered in developing the regulatory flows include TEC wastewater. TEC wastewater includes the following waste streams:

- Water and steam used to clean tank and container interiors;
- Prerinse cleaning solutions;
- Chemical cleaning solutions;
- Final rinse solutions;
- Tank or trailer exterior cleaning wastewater;
- Equipment and floor washings; and
- TEC-contaminated stormwater.

The following waste streams were not considered in developing the regulatory flows:

- Bilge and ballast waters;
- Non-TEC process wastewaters;
- Sanitary wastewater;
- Tank hydrotesting water; and
- Wastewater generated from rebuilding or maintenance activities.

Subcategory-specific regulatory flows were calculated based on responses to the Detailed Questionnaire. EPA first reviewed wastewater streams discharged by each facility and classified these streams as described above. EPA then calculated a facility-specific production-normalized flow expressed in gallons of wastewater discharged per tank cleaned based on the TEC wastewater flow rate and the annual number of tanks cleaned. Facilities that clean tanks representing multiple modes of transportation (e.g., road, rail, or inland waterway) or that clean both tanks and closed-top hoppers are considered multi-subcategory facilities. For the purpose of developing the subcategory-specific regulatory flows, these facilities were assigned a primary subcategory, and the flow contribution of any secondary subcategory was not considered in the analysis.

For each subcategory, using the facility-specific production-normalized flows and the corresponding facility-specific survey weighting factors, EPA performed a statistical analysis to determine the median wastewater volume generated per tank cleaned. Detailed information concerning calculation of the regulatory flows is included in the Statistical Support Document (1).

9.2 Best Practicable Control Technology Currently Available (BPT)

EPA proposes BPT effluent limitations for the Truck/Chemical, Rail/Chemical, Barge/Chemical & Petroleum, Truck/Food, Rail/Food, and Barge/Food Subcategories. The proposed BPT effluent limitations would control identified conventional, priority, and nonconventional pollutants when discharged from TEC facilities to surface waters of the U.S. Generally, EPA determines BPT effluent levels based upon the average of the best existing performances by plants of various sizes, ages, and unit processes within each industrial category or subcategory. In industrial categories where present practices are uniformly inadequate, however, EPA may determine that BPT requires higher levels of control than any currently in place if the technology to achieve those levels can be practicably applied.

In addition, CWA Section 304(b)(1)(B) requires a cost assessment for BPT limitations. In determining the BPT limits, EPA must consider the total cost of treatment technologies in relation to the effluent reduction benefits achieved. This inquiry does not limit EPA's broad discretion to adopt BPT limitations that are achievable with available technology unless the required additional reductions are “wholly out of proportion to the costs of achieving such marginal level of reduction.” See Legislative History, op. cit. p. 170. Moreover, the inquiry does not require the Agency to quantify benefits in monetary terms. See e.g. American Iron and Steel Institute v. EPA, 526 F. 2d 1027 (3rd Cir., 1975).

In balancing costs against the benefits of effluent reduction, EPA considers the volume and nature of expected discharges after application of BPT, the general environmental effects of pollutants, and the cost and economic impacts of the required level of pollution control. In developing guidelines, the CWA does not require or permit consideration of water quality problems attributable to particular point sources, or water quality improvements in particular bodies of water. Therefore, EPA has not considered these factors in developing the limitations being proposed today. See Weyerhaeuser Company v. Costle, 590 F. 2d 1011 (D.C. Cir. 1978).

EPA identified relatively few direct discharging facilities for most subcategories in the TECI as compared to the number of indirect discharging facilities. However, the Agency concluded that direct discharging facilities are similar to indirect discharging facilities in terms of types of tanks cleaned, types of commodities cleaned, water use, and wastewater characteristics. With respect to existing end-of-pipe wastewater treatment in place, direct discharging facilities typically operate biological treatment in addition to physical/chemical treatment technologies typically operated by indirect discharging facilities.

9.2.1 BPT Options for the Truck/Chemical Subcategory

BPT options for the Truck/Chemical Subcategory include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Equalization, Oil/Water Separation, Chemical Oxidation, Neutralization, Coagulation, Clarification, Biological Treatment, and Sludge Dewatering

Option 2: Equalization, Oil/Water Separation, Chemical Oxidation, Neutralization, Coagulation, Clarification, Biological Treatment, Activated Carbon Adsorption, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Minimum 12-hour residence time. Includes aerators/mixers to homogenize wastewater.

Oil/Water Separation

Purpose: Removal of entrained oil and grease.

Design Basis: Vertical tube coalescing separator with rotary oil skimmer. Includes demulsifier chemical additive, oil storage tank, and sludge storage tank.

Chemical Oxidation, Neutralization, Coagulation, and Clarification

Purpose: Chemical Oxidation - chemically oxidize pollutants using oxidants such as hydrogen peroxide.

Neutralization - adjust wastewater pH.

Coagulation - destabilize (reduce repulsive interaction) particle suspension using electrolytes to aggregate suspended matter.

Clarification - settle and remove agglomerated coagulated solids.

Design Basis: Turn-key treatment system consisting of four reaction tanks in series plus a clearwell. Includes chemical feed systems, mixers, control system, and sludge storage tanks.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series and a sludge storage tank.

Activated Carbon Adsorption

Purpose: Wastewater polishing.

Design Basis: Two carbon columns in series with nominal carbon change-out frequency of once per month. Includes carbon charge of 250 lb/gpm/vessel.

<u>Sludge Dewatering</u>

Purpose: Reduce sludge volume by removing water.

Design Basis: Plate-and-frame filter press. Generates dewatered sludge at 32.5% solids.

EPA is proposing to establish BPT effluent limitations based on Option 2. Agency data indicate that a treatment train consisting of physical/chemical treatment for the removal of metals and toxics, biological treatment for the removal of decomposable organic material, and activated carbon adsorption for removal of residual organics and toxics represents the average of the best treatment in the industry. As noted above, all existing direct discharging facilities in this subcategory currently employ equalization, coagulation/clarification, biological treatment and activated adsorption. Although no direct discharging facilities were given credit in EPA's costing model for a coalescing plate oil/water separator, this technology is common and demonstrated practice in the industry to improve the overall efficiency of the treatment system. EPA has included the use of oil/water separation in its cost estimates to the industry in order to ensure that the biological system performs optimally.

EPA's decision to base BPT limitations on Option 2 treatment reflects primarily two factors: 1) the degree of effluent reductions attainable and 2) the total cost of the proposed treatment technologies in relation to the effluent reductions achieved.

No basis could be found for identifying different BPT limitations based on age, size, process, or other engineering factors. Neither the age nor the size of the TEC facility will directly affect the treatability of the TEC wastewaters. For Truck/Chemical facilities, the most pertinent factors for establishing the limitations are costs of treatment and the level of effluent reductions obtainable.

The estimated compliance costs for Option 2 are $104,000 in O&M annual costs and $134,000 in total capital costs.

9.2.2 BPT Options for the Rail/Chemical Subcategory

BPT options for the Rail/Chemical Subcategory include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Oil/Water Separation, Equalization, Biological Treatment, and Sludge Dewatering

Option 2: Oil/Water Separation, Equalization, Dissolved Air Flotation (with Flocculation and pH Adjustment), Biological Treatment, and Sludge Dewatering

Option 3: Oil/Water Separation, Equalization, Dissolved Air Flotation (with Flocculation and pH Adjustment), Biological Treatment, Organo-Clay/Activated Carbon Adsorption, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

<u>Oil/Water Separation</u>

Purpose: Removal of entrained oil and grease.

Design Basis: API separator with slotted pipe surface oil skimmer, fabric belt skimmer for entrained thin oils, and bottom sludge rake. Includes oil storage tank and sludge storage tank.

<u>Equalization</u>

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Two tanks in parallel, each with minimum 24-hour residence time. Includes aerators to homogenize wastewater.

<u>Dissolved Air Flotation</u>

Purpose: Removal of entrained solid or liquid particles.

Design Basis: Dissolved air flotation unit with recycle pressurization system. Includes chemical addition systems for polymers (coagulants and flocculant) and pH adjustment, sludge collection tank, and pre-fabricated building.

<u>Biological Treatment</u>

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series and a sludge storage tank.

<u>Organo-Clay/Activated Carbon Adsorption</u>

Purpose: Wastewater polishing.

Design Basis: Two columns in series - organo-clay followed by carbon - with nominal carbon change-out frequency of one vessel per month and nominal organo-clay change-out frequency of one vessel every two months. Includes organo-clay charge of 1.44 ft^3/gpm/vessel and carbon charge of 1.44 ft^3/gpm/vessel.

<u>Sludge Dewatering</u>

Purpose: Reduce sludge volume by removing water.

Design Basis: Plate-and-frame filter press. Generates dewatered sludge at 32.5% solids. Includes sludge storage tank.

EPA is proposing to set BPT regulations for the Rail/Chemical Subcategory based on technology Option 1. EPA’s decision to base BPT limitations on Option 1 treatment reflects primarily two factors: 1) the degree of effluent reductions attainable and 2) the total cost of the proposed treatment technologies in relation to the effluent reductions achieved.

No basis could be found for identifying different BPT limitations based on age, size, process, or other engineering factors. Neither the age nor the size of the TEC facility will directly affect the treatability of the TEC wastewaters. For Rail/Chemical facilities, the most pertinent factors for establishing the limitations are costs of treatment and the level of effluent reductions obtainable.

EPA has selected Option 1 based on the comparison of the three options in terms of total costs of achieving the effluent reductions, pounds of pollutant removals, economic impacts, and general environmental effects of the reduced pollutant discharges.

EPA estimates that implementation of Option 1 will cost $103 dollars per pound of pollutants removed. Although this projected cost per pound appears to be high, EPA has used a very conservative cost approach to project costs to the industry. The one facility in EPA's cost model is already projected to meet the proposed effluent limitations due to the low effluent levels achieved at this facility, which average 8 mg/L of BOD_5. However, because EPA's proposed treatment technology includes oil/water separation, the cost model has assumed that this facility will incur additional costs to install this treatment. Additionally, EPA has given no credit to any facility for current monitoring practices. Therefore, EPA has assumed that all monitoring requirements will result in an increase in costs to the industry. In reality, this facility will likely not need to install additional treatment to meet the proposed limits, and some of the monitoring costs assumed by EPA will not be an additional cost burden to the industry.

The technology proposed in Option 1 represents the average of the best performing facilities due to the prevalence of biological treatment and sludge dewatering. Although no direct discharging facilities were given credit in EPA's costing model for oil/water separation, this technology is common and demonstrated practice in the industry to improve the overall efficiency of the wastewater treatment system. EPA has included the use of oil/water separation in its cost estimates to the industry in order to ensure that the biological system performs optimally.

Finally, EPA also looked at the costs of all options to determine the economic impact that this proposal would have on the TECI. EPA expects the financial and economic profile of the direct dischargers to be comparable to that of the estimated 38 indirect dischargers.

EPA anticipates that the economic impact, in terms of facility closures and employment losses, due to the additional controls at BPT Option 2 and 3 levels would be comparable to that estimated in EPA's assessment for indirect dischargers, potentially leading to six facility closures and the associated loss of over 400 employees. The annual cost per facility for BPT Option 1 is projected to be $12,900 less than the technology evaluated for PSES which caused six facility closures. Therefore, EPA has concluded that the costs of BPT Option 1 are achievable and are reasonable as compared to the removals achieved by this option.

The estimated compliance costs for Option 1 are $42,000 in O&M annual costs and $113,000 in total capital costs.

9.2.3 BPT Options for the Barge/Chemical & Petroleum Subcategory

BPT options for the Barge/Chemical & Petroleum Subcategory include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Oil/Water Separation, Dissolved Air Flotation, Filter Press, Biological Treatment, and Sludge Dewatering

Option 2: Oil/Water Separation, Dissolved Air Flotation, Filter Press, Biological Treatment, Reverse Osmosis, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

Oil/Water Separation

Purpose: Removal of low to moderate amounts of insoluble oil.

Design Basis: Gravity separator with 6.4-day residence time for wastewater equalization and oil, water, and solids separation. Includes two separation tanks in series with an oil removal pump and an oil storage tank.

Dissolved Air Flotation

Purpose: Removal of entrained solid or liquid particles.

Design Basis: Dissolved air flotation unit with influent pressurization system. Includes sludge storage tank.

Filter Press

Purpose: Wastewater filtration.

Design Basis: In-line plate-and-frame filter press for wastewater filtration. Generates dewatered sludge at 32.0% solids. Includes diatomaceous earth mix tank and wastewater effluent storage tank.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series, a clarifier, and a sludge storage tank.

Reverse Osmosis

Purpose: Wastewater polishing.

Design Basis: Reverse osmosis system including unit with membranes, influent wastewater storage tanks, and flooded suction tank.

Sludge Dewatering

Purpose: Reduce biological treatment sludge volume by removing water.

Design Basis: Sludge is dewatered in in-line wastewater plate-and-frame filter press described above.

EPA estimates that implementation of Option 1 will cost $0.35 per pound of pollutants removed, and has found that cost to be reasonable. Additionally, the Agency concluded that reverse osmosis is not commonly used in the industry, and therefore Option 2 does not represent the average of the best treatment. Finally, EPA also looked at the costs of all options to determine the economic impact that this proposal would have on the TECI. EPA's assessment showed that implementation of BPT is projected to result in no facility closures and no employment losses. Therefore, EPA has concluded that the total costs associated with the proposed BPT option are achievable and are reasonable as compared to the removals achieved by this option.

The estimated compliance costs for Option 1 are $1,900,000 in O&M annual costs and $3,200,000 in total capital costs.

9.2.4 BPT Options for the Truck/Food, Rail/Food, and Barge/Food Subcategories

BPT options for the Truck/Food, Rail/Food, and Barge/Food Subcategories include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Oil/Water Separation

Option 2: Oil/Water Separation, Equalization, Biological Treatment, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

Oil/Water Separation

Purpose: Removal of low to moderate amounts of insoluble oil.

Design Basis: Gravity separator with 6.4-day residence time for wastewater equalization and oil, water, and solids separation. Includes two separation tanks in series with an oil removal pump and an oil storage tank.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Eight-day residence time. Includes aerators/mixers to homogenize wastewater.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series and a sludge storage tank.

Sludge Dewatering

Purpose: Reduce biological treatment sludge volume by removing water.

Design Basis: Plate-and-frame filter press for wastewater filtration. Generates dewatered sludge at 32.0% solids. Includes diatomaceous earth mix tank.

Based on Screener Questionnaire results, EPA estimates that there are 19 direct discharging facilities in the Truck/Food, Rail/Food, and Barge/Food Subcategories. However, EPA's survey of the TECI did not initially identify any direct discharging facilities through the Detailed Questionnaire sample population.

Because all types of facilities in the food subcategories accept similar types of cargos which generate similar types of wastewater in terms of treatability and toxicity, EPA has tentatively determined that the same treatment technology can be applied to all three (truck, rail and barge) food subcategories. The wastewater generated by the food subcategories contains high loadings of biodegradable organics, and few toxic pollutants. EPA conducted sampling at a direct discharging Barge/Food facility which EPA believes to be representative of the entire population.

Based on the data collected by EPA, raw wastewater contained significant levels of organic material in the raw wastewater, exhibiting an average BOD_5 concentration of 3,500 mg/L. Therefore, EPA concluded that some form of biological treatment is necessary to reduce potential impacts to receiving waters from direct discharging facilities and EPA anticipated that all direct discharging facilities in these subcategories would have some form of biological treatment in place. All existing facilities which responded to the Screener Questionnaire indicated that they did, in fact, have a biological treatment system in place. Therefore, EPA proposes to establish BPT based on Option 2 for the Truck/Food, Rail/Food, and Barge/Food Subcategories

EPA projects no additional pollutant removals and no additional costs to the industry based on EPA's selection of Option 2 because all facilities identified by EPA currently have the proposed technology in place.

EPA estimates zero compliance costs for Option 2.

9.2.5 BPT Options for the Truck/Petroleum and Rail/Petroleum Subcategories

EPA did not develop or evaluate BPT Options for the Truck/Petroleum and Rail/Petroleum Subcategories for the following reasons: (1) all direct discharging facilities previously identified by the Agency are no longer in operation; (2) EPA is not aware of any new facilities that have recently begun operations; and (3) EPA believes that permit writers can more appropriately control discharges from these facilities, if any, using best professional judgment.

9.2.6 BPT Options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories

BPT options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Gravity Separation

The purpose and design bases of the components of this technology option are described below. This technology is also described in further detail in Section 8.3.

Gravity Separation

Purpose: Removal of suspended solids.

Design Basis: Gravity separator with 4-day residence time for wastewater equalization and solids separation. Includes two separation tanks in series.

EPA is not proposing to establish BPT regulations for any of the hopper subcategories. EPA concluded that hopper facilities discharge very few pounds of conventional or toxic pollutants. This is based on EPA sampling data, which found very few priority toxic pollutants at treatable levels in raw wastewater. Additionally, very little wastewater is generated from cleaning the interiors of hopper tanks due to the dry nature of bulk materials transported. Therefore, nationally-applicable regulations are unnecessary at this time and direct dischargers will remain subject to limitations established on a case-by-case basis using best professional judgement.

9.3 Best Conventional Pollutant Control Technology (BCT)

BCT limitations control the discharge of conventional pollutants from direct dischargers. Conventional pollutants include BOD, TSS, oil and grease, and pH. BCT is not an additional limitation, but rather replaces BAT for the control of conventional pollutants. To develop BCT limitations, EPA conducts a cost reasonableness evaluation, which consists of a two-part cost test: 1) the POTW test, and 2) the industry cost-effectiveness test.

In the POTW test, EPA calculates the cost per pound of conventional pollutants removed by industrial dischargers in upgrading from BPT to a BCT candidate technology and then compares this to the cost per pound of conventional pollutants removed in upgrading POTWs from secondary to tertiary treatment. The upgrade cost to industry, which is represented in dollars per pound of conventional pollutants removed, must be less than the POTW benchmark of $0.25 per pound (in 1976 dollars). In the industry cost-effectiveness test, the ratio of the incremental BPT to BCT cost, divided by the BPT cost for the industry, must be less that 1.29 (i.e. the cost increase must be less than 29 percent).

EPA is proposing to establish effluent limitations guidelines and standards equivalent to the BPT for the conventional pollutants covered under BPT for all subcategories. In developing BCT limits, EPA considered whether there are technologies that achieve greater removals of conventional pollutants than proposed for BPT, and whether those technologies are cost-reasonable according to the BCT Cost Test. In each subcategory, EPA identified no technologies that can achieve greater removals of conventional pollutants than those proposed for BPT that are also cost-reasonable under the BCT Cost Test, and accordingly EPA proposes BCT effluent limitations equal to the proposed BPT effluent limitations guidelines and standards.

9.4 Best Available Technology Economically Achievable (BAT)

The factors considered in establishing a BAT level of control include: the age of process equipment and facilities, the processes employed, process changes, the engineering aspects of applying various types of control techniques to the costs of applying the control technology, non-water quality environmental impacts such as energy requirements, air pollution and solid waste generation, and such other factors as the Administrator deems appropriate (Section 304(b)(2)(B) of the Act). In general, the BAT technology level represents the best existing economically achievable performance among facilities with shared characteristics. BAT may include process changes or internal plant controls which are not common in the industry. BAT may also be transferred from a different subcategory or industrial category.

EPA is proposing BAT effluent limitations for the Truck/Chemical, Rail/Chemical, and Barge/Chemical & Petroleum Subcategories based upon the same technologies evaluated and proposed for BPT. The proposed BAT effluent limitations would control identified toxic and nonconventional pollutants discharged from facilities. EPA did not identify any additional technologies beyond BPT that could provide additional toxic pollutant removals and that are economically achievable. EPA is not proposing to establish BAT limitations for the Truck/Food, Rail/Food or Barge/Food Subcategories because EPA found that food grade facilities discharge very few pounds of toxic pollutants not amenable to treatment by a POTW.

9.5 New Source Performance Standards (NSPS)

New Source Performance Standards under Section 306 of the CWA represent the greatest degree of effluent reduction achievable through the application of the best available demonstrated control technology for all pollutants (i.e. conventional, nonconventional, and toxic pollutants). NSPS are applicable to new industrial direct discharging facilities, for which construction has commenced after the publication of proposed regulations. Congress envisioned that new treatment systems could meet tighter controls than existing sources because of the opportunity to incorporate the most efficient processes and treatment systems into plant design. Therefore, Congress directed EPA, in establishing NSPS, to consider the best demonstrated process changes, in-plant controls, operating methods, and end-of-pipe treatment technologies that reduce pollution to the maximum extent feasible.

9.5.1 NSPS Options for the Truck/Chemical Subcategory

EPA has not identified any more stringent treatment technology option which it considered to represent NSPS level of control applicable to Truck/Chemical facilities in this industry. Further, EPA has made a finding of no barrier to entry based upon the establishment of this level of control for new sources. Therefore, EPA is proposing that NSPS for the Truck/Chemical Subcategory be established equivalent to BPT for conventional, priority, and nonconventional pollutants.

9.5.2 NSPS Options for the Rail/Chemical Subcategory

EPA evaluated BPT Options 2 and 3 as a basis for establishing NSPS more stringent than the BAT level of control being proposed today. The cost implications anticipated for new sources are not as severe as those projected for existing sources. By utilizing good heel removal and management practices which prevent pollutants from entering waste streams, and good water conservation practices in the design of new facilities, treatment unit size can be substantially reduced and treatment efficiencies improved. As a result, costs of achieving BPT Options 2 and 3 can be significantly reduced by new sources. BPT Option 2 and 3 technologies have been demonstrated at an existing zero discharge Rail/Chemical facility. EPA anticipates no barrier to entry for new sources employing these technologies at lower cost. Furthermore, based on an analysis of benefits for existing sources, significant environmental differences would be anticipated between Options 1 and 2 and Option 3 for new sources. Therefore, EPA is proposing to establish new source performance standards for the Rail/Chemical Subcategory based on BPT Option 3. Option 3 consists of flow reduction, oil/water separation, equalization, dissolved air flotation (with flocculation and pH adjustment), biological treatment, organo-clay/activated carbon adsorption, and sludge dewatering.

9.5.3 NSPS Options for the Barge/Chemical & Petroleum Subcategory

EPA evaluated BPT Option 2 as a basis for establishing NSPS more stringent than the proposed BAT level of control. EPA rejected BPT Option 2 as a basis for NSPS for the same reasons this additional technology was rejected for BAT. Even though the cost implications for new sources are not as severe as those projected for existing sources, the cost and economic implications of BPT Option 2 do bear upon the determination that reverse osmosis technology is inappropriate for consideration as part of the best available technology for the control of pollutants for this subcategory.

Reverse osmosis was not considered to be the best available technology due to the small incremental removals achieved by this option, the lack of additional water quality benefits potentially achieved by this option, the potential issue of disposing the liquid concentrate created by treatment, and the high level of pollutant control achieved by the proposed BAT option.

Therefore, EPA is proposing that NSPS for the Barge/Chemical & Petroleum Subcategory be established equivalent to BPT for conventional, priority, and nonconventional pollutants.

9.5.4 NSPS Options for the Truck/Food, Rail/Food, and Barge/Food Subcategories

EPA has not identified any more stringent treatment technology option which it considered to represent NSPS level of control applicable to food subcategory facilities in this industry. Further, EPA has made a finding of no barrier to entry based upon the establishment of this level of control for new sources. Therefore, EPA is proposing that NSPS for the food subcategories be established equivalent to BPT for conventional pollutants.

9.5.5 NSPS Options for the Truck/Petroleum and Rail/Petroleum Subcategories

EPA did not develop or evaluate BAT options for these subcategories for the following reasons: (1) all direct discharging facilities previously identified by the Agency are no longer in operation; (2) EPA is not aware of any new facilities that have recently begun operations; and (3) EPA currently believes permit writers can more appropriately control discharges from these facilities, if any, using best professional judgement. EPA is therefore proposing not to establish NSPS for the Truck/Petroleum and Rail/Petroleum Subcategories.

9.5.6 NSPS Options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories

EPA is not proposing to establish NSPS regulations for any of the hopper subcategories. EPA concluded that hopper facilities discharge very few pounds of toxic pollutants, and contain very few priority toxic pollutants at treatable levels in raw wastewater. Additionally, very little wastewater is generated from cleaning the interiors of hopper tanks due to the dry nature of bulk materials transported. Therefore, nationally-applicable regulations are unnecessary at this time and direct dischargers will remain subject to limitations established on a case-by-case basis using best professional judgement.

9.6 Pretreatment Standards for Existing Sources (PSES)

Pretreatment standards are designed to prevent the discharge of toxic pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs, as specified in Section 307(b) of the CWA. PSES are technology-based and analogous to BAT limitations for direct dischargers.

9.6.1 PSES Options for the Truck/Chemical Subcategory

PSES options for the Truck/Chemical Subcategory include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Equalization, Oil/Water Separation, Chemical Oxidation, Neutralization, Coagulation, Clarification, and Sludge Dewatering

Option 2: Equalization, Oil/Water Separation, Chemical Oxidation, Neutralization, Coagulation, Clarification, Activated Carbon Adsorption, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Minimum 12-hour residence time. Includes aerators/mixers to homogenize wastewater.

Oil/Water Separation

Purpose: Removal of entrained oil and grease.

Design Basis: Vertical tube coalescing separator with rotary oil skimmer. Includes demulsifier chemical additive, and oil storage tank.

Chemical Oxidation, Neutralization, Coagulation, and Clarification

Purpose: Chemical Oxidation - chemically oxidize pollutants using oxidants such as hydrogen peroxide.

Neutralization - adjust wastewater pH.

Coagulation - destabilize (reduce repulsive interaction) particle suspension using electrolytes to aggregate suspended matter.

Clarification - settle and remove agglomerated coagulated solids.

Design Basis: Turn-key treatment system consisting of four reaction tanks in series plus a clearwell. Includes chemical feed systems, mixers, control system, and sludge storage tanks.

Carbon Adsorption

Purpose: Wastewater polishing.

Design Basis: Two carbon columns in series with nominal carbon change-out frequency of once per month. Includes carbon charge of 250 lb/gpm/vessel.

Sludge Dewatering

Purpose: Reduce sludge volume by removing water.

Design Basis: Plate-and-frame filter press. Generates dewatered sludge at 32.5% solids.

EPA is proposing to establish pretreatment standards based on Option 2 based on the additional removals achieved by this option. EPA has determined that Option 2 is economically achievable and results in no facility closures or projected employment losses.

The estimated compliance costs for Option 2 are $24,700,000 in O&M annual costs and $53,600,000 in total capital costs.

9.6.2 PSES Options for the Rail/Chemical Subcategory

PSES options for the Rail/Chemical Subcategory include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Oil/Water Separation

Option 2: Oil/Water Separation, Equalization, Dissolved Air Flotation (with Flocculation and pH Adjustment), and Sludge Dewatering

Option 3: Oil/Water Separation, Equalization, Dissolved Air Flotation (with Flocculation and pH Adjustment), Organo-Clay/Activated Carbon Adsorption, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

Oil/Water Separation

Purpose: Removal of entrained oil and grease.

Design Basis: API separator with slotted pipe surface oil skimmer, fabric belt skimmer for entrained thin oils, and bottom sludge rake. Includes oil storage tank and sludge storage tank.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Two tanks in parallel, each with minimum 24-hour residence time. Includes aerators to homogenize wastewater.

Dissolved Air Flotation

Purpose: Removal of entrained solid or liquid particles.

Design Basis: Dissolved air flotation unit with recycle pressurization system. Includes chemical addition systems for polymers (coagulants and flocculant) and pH adjustment, sludge collection tank, and pre-fabricated building.

Organo-Clay/Activated Carbon Adsorption

Purpose: Wastewater polishing.

Design Basis: Two columns in series - organo-clay followed by carbon - with nominal carbon change-out frequency of one vessel per month and nominal organo-clay change-out frequency of one vessel every two months. Includes organo-clay charge of 1.44 ft^3/gpm/vessel and carbon charge of 1.44 ft^3/gpm/vessel.

Sludge Dewatering

Purpose: Reduce sludge volume by removing water.

Design Basis: Plate-and-frame filter press. Generates dewatered sludge at 32.5% solids. Includes sludge storage tank.

EPA is proposing to establish pretreatment standards for the Rail/Chemical Subcategory based on Option 1. EPA estimates that this option does not result in any facility closures or employment losses to the industry. Option 2, however, was projected to result in six facility closures and is demonstrated not to be economically achievable.

The estimated compliance costs for Option 1 are $1,400,000 in O&M annual costs and $4,400,000 in total capital costs.

9.6.3 PSES Options for the Barge/Chemical & Petroleum Subcategory

PSES options for the Barge/Chemical & Petroleum Subcategory include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Oil/Water Separation, Dissolved Air Flotation, and Filter Press

Options 2: Oil/Water Separation, Dissolved Air Flotation, Filter Press, Biological Treatment, and Sludge Dewatering

Option 3: Oil/Water Separation, Dissolved Air Flotation, Filter Press, Biological Treatment, Reverse Osmosis, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

Oil/Water Separation

Purpose: Removal of low to moderate amounts of insoluble oil.

Design Basis: Gravity separator with 6.4-day residence time for wastewater equalization and oil, water, and solids preparation. Includes two separation tanks in series with an oil removal pump and an oil storage tank.

Dissolved Air Flotation

Purpose: Removal of entrailed solid or liquid particles.

Design Basis: Dissolved air flotation unit with influent pressurization system. Includes sludge storage tank.

Filter Press

Purpose: Wastewater filtration.

Design Basis: In-line plate-and-frame filter press for wastewater filtration. Generates dewatered sludge at 32.0% solids. Includes diatomaceous earth mix tank and wastewater effluent storage tank.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series, a clarifier, and a sludge storage tank.

Reverse Osmosis

Purpose: Wastewater polishing.

Design Basis: Reverse osmosis system including unit with membranes, influent wastewater storage tanks, and flooded suction tank.

Sludge Dewatering

Purpose: Reduce biological treatment sludge volume by removing water.

Design Basis: Sludge is dewatered in in-line wastewater plate-and-frame filter press described above.

In the Agency's survey of the industry, EPA identified only one facility discharging to a POTW in this subcategory. Therefore, EPA does not propose to establish PSES limitations for the Barge/Chemical & Petroleum Subcategory. However, EPA is proposing to establish PSNS limitations.

9.6.4 PSES Options for the Truck/Food, Rail/Food, and Barge/Food Subcategories

PSES Options for the Truck/Food, Rail/Food, and Barge/Food Subcategories include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Oil/Water Separation

Option 2: Oil/Water Separation, Equalization, Biological Treatment, and Sludge Dewatering

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

Oil/Water Separation

Purpose: Removal of low to moderate amounts of insoluble oil.

Design Basis: Gravity separator with 6.4-day residence time for wastewater equalization and oil, water, and solids separation. Includes two separation tanks in series with an oil removal pump and an oil storage tank.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Eight-day residence time. Includes aerators/mixers to homogenize wastewater.

Biological Treatment

Purpose: Biologically decompose organic constituents.

Design Basis: Activated sludge biological treatment system with a 4.6-day residence time. Includes two preaeration tanks in series and a sludge storage tank.

Sludge Dewatering

Purpose: Reduce biological treatment sludge volume by removing water.

Design Basis: Plate-and-frame filter press for wastewater filtration. Generates dewatered sludge at 32.0% solids. Includes diatomaceous earth mix tank.

In the Agency’s engineering assessment of pretreatment of wastewaters for the Truck/Food, Rail/Food, and Barge/Food Subcategories, EPA considered the types and concentrations of pollutants found in raw wastewaters in this subcategory. As expected, food grade facilities did not discharge significant quantities of toxic pollutants to POTWs. In addition, conventional pollutants present in the wastewater were found at concentrations that are amenable to treatment at a POTW. As a result, EPA is proposing not to establish pretreatment standards for any of the food subcategories.

9.6.5 PSES Options for the Truck/Petroleum and Rail/Petroleum Subcategories

PSES options for the Truck/Petroleum and Rail/Petroleum Subcategories include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Equalization, Oil/Water Separation, and Chemical Precipitation

Option 2: Zero Discharge Based on Equalization, Oil/Water Separation, and Activated Carbon Adsorption Followed by Total Wastewater Recycle/Reuse

The purpose and design bases of the components of these technology options are described below. These technologies are also described in further detail in Section 8.3.

Equalization

Purpose: Reduce wastewater variability and accumulate wastewater to optimize subsequent treatment system size and operating costs.

Design Basis: Minimum 12-hour residence time. Includes aerators/mixers to homogenize wastewater.

Oil/Water Separation

Purpose: Removal of entrained oil and grease.

Design Basis: Vertical tube coalescing separator with rotary oil skimmer. Includes demulsifier chemical additive, oil storage tank, and sludge storage tank.

Chemical Precipitation

Purpose: Removal of dissolved metals and entrained solid or liquid particles.

Design Basis: Batch chemical precipitation unit including chemical feed systems, agitator, control system, pH adjustment, and sludge storage tank.

Activated Carbon Adsorption

Purpose: Wastewater polishing.

Design Basis: One 200-lb carbon column with nominal carbon change-out frequency of at least one vessel per 17,000 gallons of treated wastewater. Includes initial carbon cartridge of 200 lb/vessel.

EPA estimates that there are 38 facilities in the Truck/Petroleum and Rail/Petroleum Subcategories. EPA estimates that these facilities discharge a total of 28 pound equivalents to the nation's waterways, or less than one pound equivalent per facility. Additionally, EPA estimates that the total cost to the industry to implement PSES would be greater than $600,000 annually. The estimated costs to control the discharge of these small amounts of pound equivalents were not considered to be reasonable. Based on this analysis, EPA preliminarily concluded that there is no need to develop nationally applicable regulations for these subcategories due to the low levels of pollutants discharged by facilities in these subcategories.

Based on these factors, EPA proposes not to establish pretreatment standards for the Truck/Petroleum or Rail/Petroleum Subcategories.

9.6.6 PSES Options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories

PSES options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories include the following technology bases in addition to the common technology option elements discussed in Section 9.1.1.

Option 1: Gravity Separation

The purpose and design bases of the components of this technology option are described below. This technology is also described in further detail in Section 8.3.

<u>Gravity Separation</u>

Purpose: Removal of suspended solids.

Design Basis: Gravity separator with 4-day residence time for wastewater equalization and solids separation. Includes two separation tanks in series.

EPA estimates that there are 42 indirect discharging hopper facilities. EPA estimates that these facilities discharge a total of 3.5 pound equivalents to the nation’s waterways, or less than one pound equivalent per facility. Additionally, EPA estimates that the total cost to the industry to implement PSES would be greater than $350,000 annually. The estimated costs to control the discharge of these small amounts of pound equivalents were not considered to be reasonable.

EPA is not proposing to establish BAT limits for any priority pollutant in the hopper subcategories. EPA did, however, look at the levels of pollutants in raw wastewaters and concluded that none were present at levels that are expected to cause inhibition of the receiving POTW. Based on these factors, EPA proposes not to establish pretreatment standards for the Truck/Hopper, Rail/Hopper, or Barge/Hopper Subcategories

9.7 Pretreatment Standards for New Sources (PSNS)

Section 307 of the CWA requires EPA to promulgate both pretreatment standards for new sources and new source performance standards. New indirect discharging facilities, like new direct discharging facilities, have the opportunity to incorporate the best available demonstrated technologies including: process changes, in-facility controls, and end-of-pipe treatment technologies.

9.7.1 PSNS Options for the Truck/Chemical Subcategory

EPA is proposing to establish pretreatment standards for new sources in the Truck/Chemical Subcategory equivalent to the PSES standards. In this subcategory, EPA identified no technology that can achieve greater removals than PSES. Therefore, EPA is proposing pretreatment standards for those pollutants which the Agency has determined to pass through a POTW equivalent to PSES.

9.7.2 PSNS Options for the Rail/Chemical Subcategory

EPA evaluated PSES Options 2 and 3 as more stringent levels of control that may be appropriate for new indirect sources. The cost implications anticipated for new sources are not as severe as those projected for existing sources. By utilizing good heel removal and management practices which prevent pollutants from entering waste streams, and good water conservation practices in the design of new facilities, treatment unit size can be substantially reduced and treatment efficiencies improved. As a result, costs of achieving PSES Option 2 and

3 can be significantly reduced at new facilities. All of the technologies considered have been demonstrated at an existing zero discharge rail/chemical facility. EPA anticipates no barrier to entry for new sources employing these technologies at lower cost.

Therefore, EPA is proposing PSNS for those pollutants which the Agency has determined to pass through a POTW based on PSES Option 3. PSES Option 3 consisted of oil/water separation, equalization, dissolved air flotation (with flocculation and pH adjustment), organo-clay/activated carbon adsorption, and sludge dewatering.

9.7.3 PSNS Options for the Barge/Chemical & Petroleum Subcategory

Although the Agency is not proposing to establish PSES for the Barge/Chemical & Petroleum Subcategory, EPA did evaluate best available technologies for PSNS. EPA evaluated the PSES Options for determining levels of control that may be appropriate for new indirect sources.

EPA is not proposing to establish PSNS based on PSES Option 3 because reverse osmosis was not considered to be the best demonstrated technology due to the small incremental removals achieved by this option, the lack of additional water quality benefits potentially achieved by this option, the potential issue of disposing the liquid concentrate created by treatment, and the high level of pollutant control achieved by the proposed BAT option.

EPA is proposing to establish PSNS based on PSES Option 2 because of the removals achieved through this option. The raw wastewater in this subcategory contains significant amounts of decomposable organic materials. These materials may not be treated as efficiently as the proposed technology option in a conventional POTW because a POTW may not be acclimated to this particular wastewater stream. In this instance, pretreatment based on biological treatment may be appropriate because the pollutant parameters that pass through, or which may be present at levels that cause interference, will receive additional treatment not achieved by the POTW. Several pollutants were determined to pass through a POTW and are therefore proposed for PSNS regulation in the Barge/Chemical & Petroleum Subcategory.

9.7.4 PSNS Options for the Truck/Food, Rail/Food, and Barge/Food Subcategories

Based on the PSES analysis, EPA preliminarily concluded that there is no need to develop nationally-applicable regulations for these subcategories due to the low levels of toxic pollutants discharged by facilities in these subcategories.

EPA has not identified any more stringent treatment technology option which it considered to represent PSNS level of control and is therefore proposing not to establish PSNS for any of the food subcategories.

9.7.5 PSNS Options for the Truck/Petroleum and Rail/Petroleum Subcategories

Based on the PSES analysis, EPA preliminarily concluded that there is no need to develop nationally-applicable regulations for these subcategories due to the low levels of pollutants discharged by facilities in this subcategory. EPA proposes not to establish PSNS for the Truck/Petroleum or Rail/Petroleum Subcategories.

9.7.6 PSNS Options for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories

Based on the PSES analysis, EPA preliminarily concluded that there is no need to develop nationally-applicable regulations for these subcategories due to the low levels of pollutants discharged by facilities in this subcategory. EPA proposes not to establish PSNS for the Truck/Hopper, Rail/Hopper, and Barge/Hopper Subcategories.

9.8 References[1]

1. U.S. Environmental Protection Agency, Office of Water. Statistical Support Document of Proposed Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Category. EPA-821-B-98-014, May 1998.

[1] For those references included in the administrative record supporting the proposed TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

Table 9-1

Subcategory-Specific Regulatory Flow

Subcategory	Regulatory Flow (gallons/tank)
Truck/Chemical	605
Rail/Chemical	2,091
Barge/Chemical & Petroleum	4,857
Truck/Food	790
Rail/Food	4,500
Barge/Food	4,500
Truck/Petroleum	193
Rail/Petroleum	193
Truck/Hopper	144
Rail/Hopper	267
Barge/Hopper	712

10.0 COSTS OF TECHNOLOGY BASES FOR REGULATIONS

This section describes the methodology used to estimate the implementation costs associated with each of the regulatory options under consideration for the Transportation Equipment Cleaning Industry (TECI). Section 9.0 describes in detail the regulatory options and the technologies used as the bases for those options. The cost estimates presented in this section, together with the pollutant reduction estimates described in Section 11.0, provide a basis for evaluating the regulatory options and determining the economic impact of the proposed regulation on the TECI. The results of the economic impact assessment for the regulation are found in the Economic Assessment (EA) for the TECI proposed rulemaking (1).

EPA used the following approach to estimate compliance costs for the TECI:

- EPA mailed Detailed Questionnaires to a statistical sample of transportation equipment cleaning (TEC) facilities (discussed in Section 3.2.3). Information from the 93 facilities that responded to the questionnaire, discharge TEC wastewater, and are not covered by other effluent guidelines (see Section 3.2.3.4) was used to characterize industry-wide TEC operations, operating status, and pollutant control technologies in place for the baseline year (1994). EPA also used information from Screener Questionnaire responses (discussed in Section 3.2.2) and other sources for four direct discharging facilities to characterize the baseline for direct dischargers in two industry subcategories (see Section 10.1.2).

- EPA collected and analyzed field sampling data to determine the pollutant concentrations of untreated wastewater in the TECI (discussed in Section 6.0).

- EPA identified candidate pollution prevention and wastewater treatment technologies and grouped appropriate technologies into regulatory options (discussed in Section 9.0). The regulatory options serve as the bases of compliance cost and pollutant loading calculations.

- EPA performed sampling episodes at best performing facilities to determine pollutant removal performance for the identified technologies (see Section 11.0).

- EPA developed cost equations for capital and operating and maintenance (O&M) costs for each technology included in the regulatory options (discussed in Section 10.2.4) based on information gathered from TEC facilities, wastewater treatment system vendors, and technical literature, and on engineering judgement.

- EPA developed and used a computerized cost model to estimate compliance costs (discussed in Section 10.3) and pollutant loadings (discussed in Section 11.0) for each regulatory option.

- EPA used output from the cost model to estimate total annualized costs, cost-effectiveness values, and the economic impact of each regulatory option on the TECI (presented in the EA).

- EPA estimated industry-wide costs for the various subcategories and technology options by estimating compliance costs at 93 model sites and then using statistically calculated weighting factors to extrapolate the results to the estimated 692 TEC facilities that fall within the scope of the rule.

EPA estimated facility compliance costs for 24 unique technology options. Table 10-1 lists the number of technology options for which EPA estimated facility compliance costs.

The following information is discussed in this section:

- Section 10.1: Development of model sites;

- Section 10.2: Methodology used to estimate compliance costs;

- Section 10.3: Design and cost elements for pollutant control technologies;

- Section 10.4: Summary of estimated compliance costs by regulatory option; and

- Section 10.5: References.

10.1 Development of Model Sites

This section describes the development of the key inputs to the TECI cost model: model sites and pollutant control technologies.

10.1.1 Model Site Development

The Agency used a model site approach to estimate regulatory compliance costs for the TECI. A model site is an operating TEC facility whose data were used as input to the TECI cost model. A total of 93 facilities were used as model sites for the cost analysis because each meets the following criteria:

- The facility discharges TEC process wastewater either directly to surface waters or indirectly to a publicly-owned treatment works (POTW); and
- The facility supplied sufficient economic and technical data to estimate compliance costs and assess the economic impacts of these costs. Such data include daily flow rate, operating schedules, tank cleaning production and types of tanks cleaned, existing treatment in place, and economic status for the base year 1994.

As discussed in Section 3.2.3, EPA mailed Detailed Questionnaires to a statistical sample of TEC facilities. EPA evaluated each of the 176 respondents to determine whether the facility would be potentially affected by the regulatory options considered by the Agency and would therefore incur costs as a result of potential proposed regulations. Eighty-three facilities would not incur costs because:

- The facility is subject to other Clean Water Act final or proposed categorical standards and thus would not be subject to the limitations and standards under the proposed approach for this guideline (34 facilities); or
- The facility is a zero or alternative discharging facility (i.e., does not discharge TEC wastewater either directly or indirectly to a surface water)

and thus would not be subject to the limitations and standards for this guideline (49 facilities).

Each of the 93 facilities is considered a “model” facility since it represents a larger number of facilities in the overall industry population as determined by its statistical survey weight. The Statistical Support Document (2) discusses in detail the development of the survey weights. These facilities represent an estimated industry population of 692 facilities that discharge either directly to surface waters or indirectly to a POTW. EPA selected a facility-by-facility model approach to estimate compliance costs, as opposed to a more general modeling approach, to better characterize the variability of processes and resultant wastewaters among TEC facilities.

Although EPA estimated regulatory compliance costs on a facility-by-facility basis, EPA made certain engineering assumptions based on information from standard engineering costing publications, equipment vendors, and industry-wide data. Thus, for any given model facility (or facilities represented by the model facility), the estimated costs may deviate from those that the facility would actually incur. However, EPA considers the compliance costs to be accurate when evaluated on an industry-wide, aggregate basis.

10.1.2 Supplemental Model Site Development

EPA reviewed the 93 model facilities and identified direct dischargers in two subcategories (Barge/Chemical & Petroleum and Barge/Hopper), but none in the remaining subcategories. To assess the need to develop limitations and standards for direct dischargers for the remaining subcategories, EPA reviewed the Screener Questionnaire sample population to identify direct discharging facilities that would be subject to these regulations. This review identified the following direct dischargers by subcategory:

- Truck/Chemical (three facilities in sample population);
- Rail/Chemical (one facility in sample population);

- Truck/Food (two facilities in sample population); and
- Barge/Food (one facility in sample population).

EPA decided to estimate compliance costs for direct dischargers in the Truck/Chemical and Rail/Chemical Subcategories for the following reasons:

- Regulatory options considered for direct and indirect dischargers differ (i.e., regulatory options for direct dischargers include biological treatment while those for indirect dischargers do not); and

- Dissimilar regulatory options may result in significantly different estimated compliance costs.

Technical information required to estimate compliance costs for these facilities was obtained from the Screener Questionnaire responses, telephone conversations with facility personnel, and facility NPDES permits.

Note that the estimated compliance costs for these direct dischargers are not added to the costs estimated for the 93 model sites (described in Section 10.1) to obtain industry-wide cost estimates. Statistically, compliance costs for these direct dischargers are included within the industry-wide cost estimates based on the 93 model facilities. Therefore, EPA used estimated compliance costs for these direct dischargers only to characterize this segment of the industry further and to evaluate whether limitations and standards for these facilities are warranted.

EPA estimates that the compliance costs for direct dischargers in the food grade subcategories will be zero or insignificant for the following reasons:

- All facilities identified by EPA currently operate biological treatment and are believed to currently achieve the proposed limitations; and

- EPA assumes that current NPDES permits for these facilities require frequent monitoring for pollutant parameters regulated by this guideline (i.e., BOD_5, TSS, and oil and grease). Therefore, these facilities will not incur additional monitoring costs as a result of this proposed rulemaking.

Based on this assessment, EPA believes that developing model sites in the TECI cost model for direct discharging food grade facilities is not necessary.

10.1.3 Pollutant Control Technology Development

EPA evaluated Screener and Detailed Questionnaire responses to identify applicable pollution prevention and wastewater treatment technologies for the TECI and to select facilities for EPA's TECI site visit and sampling program. EPA conducted 39 engineering site visits at 38 facilities to collect information about TEC processes, water use practices, pollution prevention practices, wastewater treatment technologies, and waste disposal methods. Based on the information gathered from these site visits, EPA sampled untreated and/or treated wastewater streams at 18 facilities. Sections 3.3 and 3.4 discuss in more detail the engineering site visit and sampling program conducted as part of the TECI rulemaking.

In most cases, the specific pollutant control technologies costed, including equipment, chemical additives and dosage rates, and other O&M components, are the same as those operated by the facilities whose sampling data are used to represent the performance options, with adjustments made to reflect differences in wastewater flow rates or other facility-specific conditions. For example, BPT options for the Truck/Chemical Subcategory include oil/water separation and are specifically based on a vertical tube coalescing separator similar to that characterized during wastewater sampling. Therefore, EPA's estimated compliance costs are based upon implementation of a vertical tube coalescing separator. EPA chose this approach to ensure that the technology bases of the regulatory options can achieve the proposed limitations and standards and that the estimated compliance costs reflect implementation of these technology bases. EPA believes this approach overestimates the compliance costs because many facilities can likely achieve the proposed limitations and standards by implementing less expensive pollution prevention practices, substituting less expensive alternative equipment, or utilizing equipment in place that EPA did not assess as equivalent to the technology basis (see Section 10.2.5 for more detail on treatment-in-place credits).

EPA emphasizes that the proposed regulations do not require that a facility install or possess these technologies, but only that the facility comply with the appropriate effluent limitations and standards.

10.1.4 Model Sites with Production in Multiple Subcategories

Some model facilities have production in more than one subcategory. For example, a facility that cleans both tank trucks and rail tank cars that last transported chemical cargos has production in both the Truck/Chemical and Rail/Chemical Subcategories. To simplify compliance costs and pollutant reduction estimates, EPA assigned each multiple-subcategory facility a primary subcategory. For these facilities, compliance costs and pollutant reduction estimates for all facility production are assigned to the primary subcategory. This methodology may bias the subcategory cost and pollutant reduction estimates on a facility-by-facility basis; however, EPA believes that subcategory costs and pollutant reduction estimates are accurate on an aggregate basis (i.e., individual facility biases are offset within each subcategory in aggregate).

This simplification is necessary because the technology bases of the regulatory options differ for each subcategory. EPA considered an alternative approach that included designing separate treatment systems for subcategory-specific wastewater based on the subcategory regulatory options. However, to comply with the proposed regulations, a facility can implement any technology it chooses, provided it achieves the effluent limitations. Installation of two (or more) separate treatment systems is not a practical or cost-effective solution to comply with the proposed regulations. Therefore, EPA rejected this alternative approach.

Compliance costs and pollutant reduction estimates for individual facilities that clean multiple tank types are based on the assumption that facilities will install and operate the technologies chosen as the technology basis for each facility's primary subcategory. EPA does not have data available demonstrating that the technologies costed to treat each primary subcategory will effectively treat wastewaters from all potential secondary subcategories. For example, EPA does not have data available on the performance of the Truck/Chemical

Subcategory technology basis in treating Rail/Chemical Subcategory wastewater. However, EPA believes that the costed technology for the Truck/Chemical Subcategory option will control all pollutants of concern in all TEC wastewaters generated by each facility because the control technologies included in the different technology bases use similar pollutant removal mechanisms (e.g., chemical/physical treatment, secondary biological treatment, and advanced treatment for wastewater polishing).

For these reasons, EPA believes that its costing methodology for multiple-subcategory facilities is appropriate and adequately represents the compliance costs and pollutant reductions estimated at these facilities.

10.2 Costing Methodology

To accurately determine the impact of the proposed effluent limitations guidelines and standards on the TECI, EPA estimated costs associated with regulatory compliance. The Agency developed a cost model to estimate compliance costs for each of the regulatory options under BPT, BCT, BAT, PSES, PSNS, and NSPS. EPA used the cost model to estimate costs associated with implementation of the pollutant control technologies used as the basis for each option. Again, the proposed regulations do not require that a facility install and possess these technologies but only that the appropriate facility effluent limitations and standards be achieved.

10.2.1 Wastewater Streams Costed

Based on information provided by the sites in their Detailed Questionnaire (or Screener Questionnaire in the case of the four direct dischargers without a Detailed Questionnaire), follow-up letters, and telephone calls, EPA classified each wastewater steam at each site as TEC interior cleaning wastewater, other TEC commingled wastewater stream, or non-TEC wastewater. The following additional questionnaire data were used to characterize wastewater streams:

- Flow rate;
- Production rate (i.e., types and number of tanks cleaned); and
- Operating schedule.

EPA first reviewed wastewater streams discharged by each facility and classified these streams as interior cleaning wastewater or other commingled wastewater stream. Facilities that clean tanks representing multiple modes of transportation (e.g., road, rail, or inland waterway) or that clean both tanks and closed-top hoppers are considered to have multiple wastewater streams. However, as discussed in Section 10.1.4, these facilities are assigned a primary subcategory, and the TECI cost model costs the flow contribution of wastewater from any secondary subcategory as primary subcategory wastewater.

For costing purposes, TEC wastewater consists of tank interior cleaning wastewater and other commingled wastewater streams not easily segregated. Examples of interior cleaning wastewater are water, condensed steam, prerinse cleaning solutions, chemical cleaning solutions, and final rinse solutions generated from cleaning tank and container interiors. Examples of other commingled waste streams not easily segregated are tank or trailer exterior cleaning wastewater, TEC-contaminated stormwater, boiler blowdown, safety equipment cleaning wastewater, bilge and ballast waters, and other non-TEC wastewater streams that are commingled with TEC wastewaters. Incidental and non-TEC wastewater streams are included in developing the compliance costs because these streams are difficult or costly to segregate and treat separately from TEC wastewater.

Wastewater streams not considered in developing compliance costs include sanitary wastewater; tank hydrotesting wastewater; and repair, rebuilding, and maintenance wastewater. These wastewater streams are not costed for treatment because they fall under the scope of another rulemaking or they do not fall within the scope of the TECI rulemaking, and they are generally easily segregated from TEC wastewaters.

10.2.2 Influent Pollutant Concentrations

The concentration of each pollutant in each model site TEC wastewater stream was estimated using field sampling pollutant loadings data for wastewater discharged by tank type. Section 3.4 discusses the field sampling program. These data are used with Detailed or Screener Questionnaire flow, tank cleaning production, and operating data to calculate the influent concentrations. Section 11.0 describes these calculations in more detail.

10.2.3 Cost Model Development

EPA developed a computerized design and cost model to estimate compliance costs and pollutant reductions for the TECI technology options. EPA evaluated the following existing cost models from other EPA effluent guidelines development efforts to be used as the basis for the TECI cost model:

- Metal Products and Machinery (MP&M) Phase I Industries Design and Cost Model; and
- Pharmaceuticals Industry Cost Model.

EPA incorporated modified parts of both models in the TECI cost model.

The TECI cost model contains technology “modules,” or subroutines; each module calculates direct capital and annual costs for installing and operating a particular wastewater treatment or pollution reduction technology. In general, each module is exclusive to one control technology. For each regulatory option, the TECI cost model combines a series of technology modules. There are also module-specific “drivers” (technology drivers) that operate in conjunction with the technology modules. These drivers access input data, run the corresponding modules, and populate output databases. The technology drivers are bound together by primary drivers, which run the technology drivers in the appropriate order for each regulatory option.

EPA adapted the MP&M cost model drivers for the TECI cost model with the following modifications:

- Costs are tracked by subcategory. The MP&M cost model was not designed to develop separate costs and loads by subcategory.
- All data values calculated by the cost model are stored in an output database file. This allows the cost model user to examine the importance of each calculated value for each technology module.

The input data to the cost model include production data (i.e., types and number of tanks cleaned), wastewater flow, existing technology in place, operational hours per day, and operational days per year. EPA obtained the flow rates, operating schedules, production data, and existing treatment-in-place data from Detailed Questionnaire responses from each facility (and other data sources for supplemental facilities, as discussed in Section 10.1.2). These data comprise the input data for the technology modules. Each module manipulates the input data (stored in data storage files) to generate output data (stored in different data storage files), which represent costs incurred by implementing the costed technology. The output data storage files become the input data storage files for subsequent technology modules, enabling the cost model to track operating hours per day and days per year, flows, and costs for subsequent modules.

10.2.4 Components of Compliance Costs

EPA used the TECI cost model to calculate capital costs and annual O&M costs for each technology and to sum the capital and O&M costs for all technologies at each facility. Capital costs comprise direct and indirect costs associated with the purchase, delivery, and installation of pollutant control technologies. Annual O&M costs comprise all costs related to operating and maintaining the treatment system for a period of one year, including the estimated costs for compliance monitoring of the effluent. O&M costs typically include the following:

- Operational labor;
- Maintenance and repair labor;
- O&M materials;
- Chemicals, filters, and other items consumed in the routine operations of the treatment system;
- Utilities such as water usage and electricity required to power the treatment system;
- Removal, transportation, and disposal of any waste solids, sludges, oils, or other wastes generated by the treatment system; and
- Analytical monitoring.

10.2.4.1 Capital Costs

The TECI cost model uses the cost equations listed in Table 10-2 to estimate the direct capital costs for purchasing, delivering, and installing equipment included in the technology bases for each regulatory option. Where possible, cost sources (i.e., vendors) provide all three cost components for varying sized equipment. Where a vendor quote is not available, literary references or estimates based on engineering judgement are used to estimate direct capital cost. Direct capital costs consist of the following:

- Purchase of treatment equipment and any accessories;
- Purchase of treatment equipment instrumentation (e.g., pH probes, control systems);
- Installation costs (e.g., labor and rental fees for equipment such as cranes);

- Delivery cost based on transporting the treatment system an average of 500 miles;

- Construction of buildings or other structures to house major treatment units (e.g., foundation slab, enclosure, containment, lighting and electricity hook-ups); and

- Purchase of necessary pumps (e.g., for wastewater transfer, chemical addition, sludge handling).

Direct capital costs consist of technology-specific equipment capital costs that are estimated by the TECI cost model. Indirect capital costs are not technology-specific and are instead represented as a multiplication factor that is applied to the direct capital costs in the post-processing portions of the TECI cost model. Indirect capital costs typically include the following:

- Purchase and installation of necessary piping to interconnect treatment system units (e.g., pipe, pipe hangers, fittings, valves, insulation, similar equipment);

- Engineering costs (e.g., administrative, process design and general engineering, communications, consultant fees, legal fees, travel, supervision, and inspection of installed equipment);

- Secondary containment and land costs;

- Excavation and site work (e.g., site clearing, landscaping, fences, walkways, roads, parking areas);

- Construction expenses (e.g., construction tools and equipment, construction supervision, permits, taxes, insurance, interest);

- Contingency (e.g., allocation for unpredictable events such as foul weather, price changes, small design changes, and errors in estimates); and

- Contractors' fees.

For each technology, EPA accounted for indirect capital costs by applying a cost factor related to the purchased, shipped, and installed capital cost. The total capital investment (direct and indirect capital cost) is obtained by multiplying the direct capital cost by the indirect capital cost factor. Table 10-3 (at the end of this section) presents the components of the total capital investment, including the indirect capital cost factor used by the cost model.

Capital cost equations relate direct capital cost to equipment design parameters, such as wastewater flow. Equipment component designs are generally based upon the equipment operated by the facilities whose sampling data are used as the basis for the technology options. To relate the design of the equipment operated by the sampled facility to that required by the costed facilities, the TECI cost model typically uses a "design equation." For example, a sampled facility with a nominal wastewater flow rate of 50 gpm operates a 65-gpm dissolved air flotation (DAF) unit. The design equation developed for the DAF unit is:

$$\text{DAFGPM} = \text{INFGPM} \times \left(\frac{65}{50}\right) = \text{INFGPM} \times 1.3 \tag{1}$$

where:

DAFGPM	=	DAF unit nominal capacity (gpm)
INFGPM	=	Influent flow rate (gpm)

In this example, the equipment design parameter for the DAF unit is the facility's wastewater flow rate, and the equipment costing parameter is the DAF unit's nominal capacity.

Cost equations are used throughout the TECI cost model to determine direct capital costs. For a given equipment component, a cost curve is developed by plotting different equipment sizes versus direct capital costs. Equipment sizes used to develop the cost equations correspond to the range of sizes required by the costed facilities based on an influent flow rate or volume requirement. The cost/size data point pairs are plotted and an equation for the curve that provides the best curve fit for the plotted points with the least standard error is calculated. The equations calculated to fit the cost curves are most commonly polynomial, but may be linear, exponential, or logarithmic.

Because of the variability in wastewater flow rates at TEC facilities, equipment design equations estimate that some facilities would require very small pieces of equipment. In some instances, EPA determined that very small equipment is either not commercially available or not technically feasible. In these cases, the facility is costed for the smallest equipment size that is both commercially available and technically feasible. For wastewater streams requiring equipment with a capacity above the maximum-sized unit commercially available and technically feasible, multiple units of equal capacity are designed to operate in parallel.

10.2.4.2 Annual Costs

Annual cost components include costs for operational labor, maintenance and repair labor, operating and maintenance materials, electricity, treatment chemicals, filter replacements, disposal of treatment system residuals, and monitoring.

Annual costs typically are not estimated using cost curves. Operational, maintenance, and repair labor are estimated as a labor time requirement per equipment component or a fraction of the total operational hours per day and operational days per year for the costed facility. Labor time is converted to a constant labor cost used throughout the TECI cost model. The TECI cost model uses the wage rate specified in The Richardson Rapid System Process Plant Construction Estimating Standards (3) for installation workers in 1994 ($25.90 per hour) for all required labor to install, operate, and maintain the systems associated with the technology bases. Electricity costs are based on operating time and required horsepower, which are converted to electricity costs using a standard rate used throughout the TECI cost model. The TECI cost model uses the average cost for electricity of $0.047 per KW-hr from the MP&M cost model (4). Chemical addition feed rates, filter replacements, and wastewater treatment residual generation rates are generally based on wastewater flow rate. These rates are converted to costs using unit cost data (e.g., $/weight) provided by chemical vendors and waste disposal facilities. The TECI cost model uses water rates from the 1992 Rate Survey of Water and Wastewater conducted by Ernst and Young (5). The water rate is adjusted from the 1992 rate of $2.90 per

1,000 gallons to the 1994 rate of $2.98 per 1,000 gallons using the capital investment index discussed later in this section.

Table 10-4 presents the O&M unit costs used by the cost model and includes references for the origin of each cost.

EPA adjusted water fees and monitoring costs calculated by the cost model to 1994 dollars because all facility-specific information in the questionnaire database is from 1994. This adjustment allows direct comparison between financial data reported in the Detailed Questionnaire and calculated compliance costs for each facility. Costs are adjusted based on the Chemical Engineering (CE) Plant Cost 1994 annual index and the index value for the year in which costs were originally reported using the following formula (6):

$$AC = OC \left(\frac{368.1}{OCI} \right) \tag{2}$$

where:

AC	=	Adjusted cost, 1994 dollars
OC	=	Original cost, dollars
OCI	=	Original cost year index

10.2.5 Treatment-in-Place Credit

EPA evaluated facility responses to the Detailed Questionnaire to determine whether pollutant control technologies are currently in place. These facilities are given credit for having “treatment in place” to ensure that EPA accurately assesses the baseline (1994) costs and pollutant loadings. Where appropriate, these treatment credits are used to develop cost estimates for system upgrades instead of costing for new systems. No costs beyond necessary additional compliance monitoring are estimated for facilities currently using pollutant control technologies with sufficient capacity equivalent to a regulatory option.

EPA reviewed questionnaire data for each model facility to assess the types of end-of-pipe technologies in place at each site (e.g., oil/water separation, biological oxidation). EPA identified end-of-pipe technologies on site that, based on technical consideration, are considered equivalent to technologies included in the TECI technology options. For example, belt filter presses are considered equivalent to plate-and-frame filter presses for sludge dewatering. EPA also identified technologies that are not considered equivalent, and for which no credit for treatment in place is given. For example, oil/water separator skimmers are not considered equivalent to vertical tube oil/water coalescers. Site-specific assumptions regarding treatment in place at model sites are included in the administrative record for this rulemaking.

EPA used operating schedule data and site-specific technology specifications from the Detailed Questionnaire responses to assess the capacity of the end-of-pipe technologies in place at the model sites. EPA assumed that each model site operates the technologies in place at full capacity at baseline (i.e., currently). Therefore, EPA used the operating schedule and capacity of each technology as reported in the questionnaire to define its maximum operating capacity. EPA uses the maximum operating capacity to assign facilities full or partial treatment-in-place credit. Partial treatment-in-place credit is assigned to facilities judged to not have enough treatment capacity in place.

Facilities receiving full treatment-in-place credit for a given technology are not expected to incur additional capital or O&M costs. However, the facility may incur additional costs for items not directly associated with the unit, such as monitoring costs. Facilities receiving partial treatment-in-place credit incur additional capital and O&M costs under the proposed regulatory options for an additional unit to treat the wastewater flow that is above the existing unit's capacity.

10.2.6 Calculation of Baseline Parameters

As discussed in the previous section, EPA determined the treatment in place for the costed facilities. Before running the cost model for any of the technology options, a baseline run of the model is performed to determine the following:

- Baseline (1994) annual costs incurred by each model site;
- Baseline non-water quality impacts, such as electricity usage, sludge and solid waste generation, and waste oil generation; and
- Baseline pollutant loadings.

The baseline values for annual costs, non-water quality impacts, and pollutant loadings are subtracted from the costs calculated for each technology option to estimate the incremental costs of compliance with each regulatory option. EPA uses the incremental costs, non-water quality impacts, and pollutant loadings to represent economic and environmental impacts of the rulemaking.

10.2.7 Contract Haul in Lieu of Treatment

For some facilities and regulatory options, particularly those with low flow rates, contract hauling is less expensive than performing on-site treatment. For those facilities, EPA estimates compliance costs based on contract hauling wastewater for off-site treatment instead of the technology bases for the particular regulatory option.

To assess contract hauling in lieu of treatment, EPA compares the net present cost of contract hauling the wastewater to be treated to the net present cost of treating that wastewater on site for each regulatory option (assuming 7% interest and a 15-year equipment life span for all capital equipment). Capital and annual costs estimated for contract hauling wastewater include a wastewater storage tank, repair labor, O&M materials, and transport and off-site disposal of the wastewater.

10.3 Design and Cost Elements for Pollutant Control Technologies

10.3.1 Cost Model Components

The TECI cost model consists of several programming components, which can be grouped into four major categories:

- Model shell programs;
- Primary model drivers;
- Data storage files; and
- Technology drivers and modules.

The model shell includes programs that create the various menus and user interfaces that accept user inputs and pass them to the appropriate memory storage areas. The primary model drivers are programs that access technology drivers in the appropriate order for each option and process the model-generated data. Data storage files are databases that contain cost model input and output data. Information typically stored in data storage files includes:

- Flow, production, and operating data associated with each wastewater stream;
- Pollutant concentrations associated with each wastewater stream; and
- Facility-specific data regarding existing technologies in place (discussed in Section 10.2.5).

Technology drivers and modules are programs that calculate costs and pollutant loadings for a particular pollutant control technology. EPA developed cost modules for the water conservation practices and wastewater treatment technologies included in the regulatory options for the TECI.

The technology drivers perform the following functions, as applicable, for each technology costed for a facility:

- Locate and open all necessary input data files;
- Store input data entered by the user of the model;
- Open and run the appropriate technology modules; and
- Calculate and track the following types of information generated by each technology module:
  - Total direct capital costs,
  - Total direct annual costs,
  - Electricity use and associated cost,
  - Water use and associated cost,
  - Sludge generation and associated disposal costs,
  - Solid waste generation and associated disposal costs,
  - Waste oil generation and associated disposal costs,
  - Effluent flow rate, and
  - Effluent pollutant concentrations.

The following table lists the treatment technologies that are modeled in the cost model. Sections 10.3.2 through 10.3.21 discuss the technology modules.

Cost Module	Section Number
Flow Reduction	10.3.2
Equalization	10.3.3
Oil/Water Separation (Vertical Tube Coalescing)	10.3.4
Oil/Water Separation (API)	10.3.5
Oil/Water Separation (Gravity)	10.3.6
Gravity Separation	10.3.7
Chemical Oxidation, Neutralization, Coagulation, Clarification	10.3.8
Dissolved Air Flotation (DAF) (with pH Adjustment and Chemical Addition)	10.3.9
DAF (No Chemical Addition)	10.3.10
Chemical Precipitation	10.3.11

Cost Module	Section Number
Filter Press (For Wastewater Clarification and Sludge Dewatering)	10.3.12
Biological Treatment	10.3.13
Activated Carbon Adsorption (Vessels)	10.3.14
Activated Carbon Adsorption (Canisters)	10.3.15
Organo-Clay/Activated Carbon Adsorption	10.3.16
Reverse Osmosis	10.3.17
Sludge Dewatering	10.3.18
Contract Haul of Wastewater in Lieu of Treatment	10.3.19
Compliance Monitoring	10.3.20
Waste Hauling	10.3.21

10.3.2 Flow Reduction

In this module, EPA estimates costs for a facility to install wastewater reduction technologies in order to reduce the volume of wastewater generated per tank cleaned. The flow reduction module design is based on the ratio of the current volume of wastewater generated per tank cleaned to the target volume of wastewater generated per tank cleaned. The target volume of wastewater generated per tank cleaned is the "regulatory flow" as discussed in Section 9.1. The module compares the regulatory flow to the current flow and costs facilities for different flow reduction technologies based on their subcategory and/or the magnitude of their ratio of regulatory flow to current flow (the "flow ratio"). Facilities with a flow ratio less than or equal to 1 (i.e., facilities generating less than the regulatory flow of wastewater per tank cleaned) are not costed in the flow reduction module.

Where the TECI cost model reduces facility wastewater flow rates through volume reduction, specific capital and O&M costs are estimated to account for the costs those facilities would incur to implement flow reduction technologies and practices. Because of the variation in tank types and cleaning practices between subcategories, the costs for implementing flow reduction technologies are different for each subcategory.

EPA bases the implementation costs for flow reduction on data received in response to the TECI Detailed Questionnaire, technologies and practices observed during site visits and sampling episodes at TEC facilities, information received from vendors on the flow reduction technologies, and technical literature. However, EPA does not have information available for every costed facility to determine the extent to which flow reduction is achievable and the exact equipment components and changes in standard operating procedures necessary to achieve the flow reductions estimated by the cost model. Although the cost model estimates costs incurred and wastewater volume reduction achieved by flow reduction, the costs and flow reductions may not be completely accurate for every costed facility due to limitations in the available data. However, EPA believes that the cost model accurately estimates the flow reduction and associated costs for the industry as a whole.

Capital and annual costs for the following equipment and practices listed below are included in the flow reduction module:

- Replacement tank cleaning system (Truck/Chemical, Rail/Chemical, Truck/Food, Rail/Food, Truck/Petroleum, and Rail/Petroleum Subcategories);
- Two spinners - one high flow for cleaning solution and one low flow for rinse (Truck/Chemical, Rail/Chemical, Truck/Food, Rail/Food, Truck/Petroleum, and Rail/Petroleum Subcategories);
- Excess heel disposal (Barge/Chemical & Petroleum, Barge/Food, and Barge/Hopper Subcategories); and
- Cleaning crew training and wastewater flow rate monitoring for all subcategories.

Annual costs include tank cleaning crew training, wastewater flow rate monitoring, and off-site excess heel disposal for the Barge/Chemical & Petroleum, Barge/Food, and Barge/Hopper Subcategories. Annual costs for operating a replacement tank cleaning system and spinners are assumed to equal baseline costs for operating existing tank cleaning systems; therefore, no additional annual costs are calculated in the cost module for implementing these technologies. The flow reduction module does estimate additional capital costs for the Barge/Chemical & Petroleum and Barge/Food Subcategories because EPA determined that additional capital equipment is not necessary at these facilities to dispose of excess heel. However, the flow reduction module includes costs for the annual labor crew training and wastewater flow rate monitoring associated with disposal of excess heel.

The flow reduction module uses information from responses to the Detailed Questionnaire on current wastewater generation per tank and the number of tanks cleaned along with the regulatory flow (described in Section 9.0) to estimate the annual cost credits (i.e., negative annual costs) for savings from reduced water usage. The total volume of water saved is shown by the following equation:

$$WS = (CWG \times NT) - (RFWG \times NT) \qquad (3)$$

where:

WS	=	Water savings (gallons/year)
CWG	=	Current wastewater generated per tank cleaned (gallons)
NT	=	Number of tanks cleaned per year
RFWG	=	Regulatory flow wastewater generated per tank cleaned (gallons) (see Table 9-1 for specific regulatory flows)

The volume of water saved is then multiplied by the cost of fresh water (as described in Section 10.2.4.2) to estimate monetary savings from reductions in wastewater use.

10.3.3 Equalization

In this module, EPA estimates costs for a facility to install and operate an equalization tank(s) to accumulate wastewater in order to reduce wastewater variability and to optimize the size, effectiveness, and operating costs for the subsequent treatment units. The required equalization tank size depends on a minimum wastewater residence time. Minimum residence times vary by subcategory (details provided in Section 9.0) based on the ratio of equalization tank size to total wastewater flow rate as observed during EPA sampling episodes and site visits. The equalization module calculates the costs necessary to operate an equalization unit as well as to adequately mix wastewater.

Capital and annual costs for the following equipment are included in the equalization module:

- Equalization tank(s); and
- Aerators/mixer(s).

Annual costs include operational labor, maintenance and repair labor, O&M materials, and electricity. The costs associated with the equalization tank(s) are based on tank volume necessary to perform adequate equalization of TEC wastewater, as observed during EPA site visits and sampling episodes. The costs associated with the aerator/mixer(s) are based on the motor horsepower required to adequately mix the wastewater in the equalization tank, as observed during EPA site visits and sampling episodes.

10.3.4 Oil/Water Separation (Vertical Tube Coalescing)

In this module, EPA estimates costs for a facility to install and operate a vertical tube coalescing oil/water separator to remove entrained oil and grease. The oil/water separation module calculates the costs necessary to treat wastewater using a vertical tube coalescing separator and a demulsifier that is added to the wastewater to aid in oil separation. The module also calculates the costs for removing, storing, and disposing of floating oil and settled solids.

Capital and annual costs for the following equipment are included in the vertical tube coalescing oil/water separator module:

- A demulsifier feed system (including a metered-flow pump and demulsifier);

- An influent wastewater transfer pump;
- An oil/water separator unit (including a water level probe and control system);
- An oil storage tank;
- A sludge transfer pump; and
- A sludge storage tank.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, raw materials (i.e., demulsifier), and oil and settled solids disposal. The oil/water separator observed during EPA site visits and sampling episodes at TEC facilities is sized with 25% excess capacity due to fluctuations in daily wastewater flows. EPA likewise estimates vertical tube coalescing oil/water separator costs based on a unit with a capacity that exceeds daily wastewater flow rates by 25%.

The demulsifier feed system costs are based on the feed rate of demulsifier observed during EPA site visits and sampling episodes. The costs associated with the wastewater transfer and sludge transfer pumps are based on the horsepower necessary to pump wastewater and sludge at the flow rates estimated by the oil/water separator module.

The waste oil storage tank and sludge storage tank costs are based on tank volume. The oil storage tank is sized to hold the volume of oil collected over 10 operating days, and the sludge storage tank is sized to hold the volume of sludge collected over a period of one month.

EPA assumes that floating oils will be disposed off site once every 10 facility operating days and settled solids will be disposed off site once per month, based on observations made during site visits and sampling episodes. Waste disposal costs are calculated separately in the waste haul module (see Section 10.3.21). The oil/water separator module calculates the amount of oil to be disposed using the difference between the influent and effluent average total oil and grease concentrations per day. The oil/water separator module calculates the amount of sludge to be disposed using the difference between the influent and effluent average total suspended solids concentrations per day. EPA assumes that the waste oil stream comprises 95% oil and the settled solids stream comprises 4% solids, based on assumptions used in the MP&M cost model.

10.3.5 Oil/Water Separation (American Petroleum Institute [API] Separator)

In this module, EPA estimates costs for a facility to install and operate an API oil/water separator to remove entrained oil and grease. The module calculates costs necessary to operate an API separator with a slotted pipe surface oil skimmer, a fabric belt skimmer for entrained thin oils, and a bottom sludge rake. The module also calculates the costs to remove, store, and dispose of skimmed oils and settled solids.

Capital and annual costs for the following equipment are included in the API oil/water separator module:

- An API oil/water separator;
- A wastewater transfer pump;
- An oil storage tank; and
- A sludge storage tank.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and disposal of residual oil and settled solids. The API oil/water separator costs are based on the ratio of API oil/water separator nominal capacity to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The unit nominal capacity is four times that needed to accommodate facility average daily wastewater flow rates to account for fluctuations in daily wastewater flow and to allow for ample wastewater residence. The unit uses two motors, a scraper/skimmer motor, and an oil collection belt skimmer motor. Electricity costs are based on motor horsepower necessary to operate the scraper/skimmer and oil collection belt skimmer.

The wastewater transfer pump costs are based on the influent wastewater flow rate for each facility. The pump is designed to operate at a flow rate of one-half the stated maximum capacity of the pump. Electricity costs are based on motor horsepower necessary to transfer wastewater at the flow rates estimated by the oil/water separator module.

The waste oil storage tank and sludge storage tank costs are based on tank volume. The oil storage tank and the sludge storage tank are sized to hold the volume of oil and the volume of sludge, respectively, collected over a period of one month.

EPA assumes that floating oils and settled solids will be disposed off site once per month (provided sludge dewatering is not costed as part of the regulatory option) based on observations made during site visits and sampling episodes. Waste disposal costs are calculated separately in the waste haul module (see Section 10.3.21). The API oil/water separator module calculates the amounts of oil and sludge to be disposed based on the ratios of the oil and sludge generation rates to the facility wastewater flow rates observed during EPA site visits and sampling episodes at TEC facilities. If sludge dewatering is costed, the sludge is costed to be pumped from the sludge storage tank to the filter press (the costs for the sludge pump are included in the sludge dewatering module). EPA assumes that the waste oil stream comprises 95% oil and the settled solids stream comprises 4% solids, based on assumptions used in the MP&M cost model.

10.3.6 Oil/Water Separation (Gravity)

In this module, EPA estimates costs for a facility to install and operate a gravity oil/water separator to remove floating oils from raw wastewater. The module also calculates the costs necessary to remove, store, and dispose of floating oils. For the food subcategories, no oil disposal costs are incurred because EPA assumes oil will be recycled to animal feed and/or soap poduct manufacturing based on practices observed during EPA site visits and sampling episodes at TEC facilities. The module calculates the costs for removing, storing, and disposing of settled solids for the food subcategories but not for the Barge/Chemical & Petroleum Subcategory, because EPA assumes gravity oil/water separators at Barge/Chemical & Petroleum facilities will generate a negligible amount of settled solids based on observations made during EPA site visits and sampling episodes.

Capital and annual costs for the following equipment are included in the gravity oil/water separation module:

- A gravity oil/water separator;
- Two wastewater transfer pumps (only one for Barge/Chemical & Petroleum);
- An oil transfer pump;
- An oil storage tank (Barge/Chemical & Petroleum only);
- A sludge transfer pump (food subcategories only); and
- An oil/water separator effluent pump (Barge/Chemical & Petroleum only).

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal costs. The gravity oil/water separator costs are based on tank volume designed to provide a wastewater residence time of 6.4 days, as observed during EPA site visits and sampling episodes at TEC facilities.

The wastewater transfer pumps and oil transfer pump costs are based on the respective wastewater and oil flow rates estimated by the oil/water separator module. The pumps are designed to operate at an average flow rate of one-half the stated maximum flow-rate capacity of the pump. Electricity costs are based on the pump motor horsepower necessary to transfer wastewater and oil at the flow rates estimated by the oil/water separator module. The sludge transfer pump costs are based on the horsepower necessary to pump sludge at the flow rates estimated by the oil/water separator module. The effluent wastewater pump costs are based on effluent wastewater flow rate. Electricity costs are based on the motor horsepower necessary to pump wastewater to the subsequent treatment unit.

Oil and sludge management practices are based on practices observed during EPA site visits and sampling episodes at TEC facilities. For the Barge/Chemical & Petroleum Subcategory, oil is collected in a tank and assumed to be hauled off site every 5 days. Oil storage tank costs are based on the tank volume necessary to hold the oil generated over a 5-day period. For the Truck/Food, Rail/Food and Barge/Food Subcategories, oil is pumped directly from the gravity oil/water separator tank for off-site disposal twice per year. Sludge is collected either directly from the gravity oil/water separator tank and hauled off site for disposal once per month or pumped to a sludge storage tank (included in the biological treatment module) for subsequent on-site sludge dewatering. Waste disposal costs are calculated separately in the waste haul module (see Section 10.3.21). The oil and sludge volumes generated (where applicable) are calculated based on the ratios of the oil and sludge generation rates to the facility wastewater flow rates observed during EPA site visits and sampling episodes at TEC facilities. EPA assumes that the waste oil stream comprises 95% oil and the settled solids stream comprises 4% solids, based on assumptions used in the MP&M cost model.

10.3.7 Gravity Separation

In this module, EPA estimates costs for a facility to install and operate a gravity separator to remove suspended solids from raw wastewater. The gravity separator module calculates the costs necessary to treat wastewater using a gravity separator that allows solids to settle to the bottom of the unit. The module also calculates the costs for removing, storing, and disposing of settled solids.

Capital and annual costs for the following equipment are included in the gravity separation module:

- A gravity separator tank;
- Two wastewater transfer pumps; and
- A sludge transfer pump (if sludge generation is less than 1,265 gallons per month).

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal costs. The gravity separator tank costs are based on a tank volume designed to provide a wastewater residence time of 4 days, as observed during EPA site visits and sampling episodes at TEC facilities.

The wastewater transfer pump costs are based on influent wastewater flow rate. The pumps are designed to operate at a flow rate of one-half the stated maximum flow rate capacity of the pumps. Electricity costs are based on motor horsepower necessary to transfer wastewater at the flow rates estimated by the gravity separator module. The sludge transfer pump costs are based on motor horsepower necessary to transfer sludge at the flow rates estimated by the gravity separator module.

EPA assumes that settled solids will be disposed off site once per month based on observations made during site visits and sampling episodes at TEC facilities. Waste disposal costs are calculated separately in the waste haul module (see Section 10.3.21). The sludge volume generated by the gravity separator is calculated based on the ratios of the sludge generation rates to the facility wastewater flow rates observed during EPA site visits and sampling episodes at TEC facilities. Sludge is assumed to accumulate in the bottom of the gravity separator tank. If the monthly sludge generation is less than 1,265 gallons, it is more economical for a facility to pump the sludge into drums for disposal. Otherwise, a vacuum truck (provided by the sludge disposal company) would be used to remove the sludge. EPA assumes the settled solids stream comprises 4% solids, based on engineering literature.

10.3.8 Chemical Oxidation, Neutralization, Coagulation, and Clarification

In this module, EPA estimates costs for a facility to install and operate a turn-key treatment system consisting of four reaction tanks in series and a clearwell. Treatment steps include: chemical oxidation to oxidize organic pollutants using hydrogen peroxide; neutralization to adjust wastewater pH; coagulation to destabilize suspended matter using polyalum chloride (an electrolyte); and clarification to settle and remove agglomerated solids using a polymer flocculant. The module calculates costs necessary for the turn-key treatment system, including the reaction tanks, clearwell, chemical feed systems, mixers, control system, and two sludge storage tanks. The module also calculates the costs to collect solids from the bottom of the clarifier and pump the sludge into a sludge storage tank in preparation for dewatering.

Capital and annual costs for the following equipment are included in the chemical oxidation, neutralization, coagulation, and clarification module:

- Four reaction tanks;
- Two sludge storage tanks;
- A clearwell;
- Five chemical feed systems;
- Two mixers;
- An influent wastewater pump;
- A sludge pump (sized at 20 gpm); and
- A control system.

Annual costs include operational labor, maintenance and repair labor, O&M materials, and electricity. The turn-key package system costs are based on the nominal wastewater flow rate capacity of the unit. The turn-key package system observed during EPA sites visits and sampling episodes at TEC facilities is sized with 25% excess capacity due to fluctuations in daily wastewater flows. EPA likewise estimates turn-key package system costs based on a unit with a capacity that exceeds daily wastewater flow rates by 25%. Electricity costs for the mixers, chemical feed systems, and sludge pump are based on motor horsepower necessary to operate the turn-key unit.

10.3.9 DAF (with pH Adjustment and Chemical Addition)

In this module, EPA estimates costs for a facility to install and operate a DAF unit designed to remove entrained solid or liquid particles. The module calculates the costs necessary to operate a DAF unit with a recycle pressurization system, chemical addition systems for polymers (coagulants and flocculant) and pH adjustment, and a sludge collection tank. The module also calculates costs for a pre-engineered building to enclose the treatment unit.

Capital and annual costs for the following equipment are included in the DAF module:

- A wastewater transfer pump;
- A chemical treatment tank system;
- A polymer mixing tank system;
- A polymer dilution tank system;
- A DAF unit;
- An air compressor;
- A sludge storage tank; and
- A pre-engineered building.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and chemical costs. The DAF unit observed during EPA site visits and sampling episodes at TEC facilities is sized with 30% excess capacity due to fluctuations in daily wastewater flows. EPA likewise estimates DAF unit costs based on a unit with a capacity that exceeds daily wastewater flow rates by 30%. The unit uses two motors: a surface skimmer motor and a pressurization motor pump. Electricity costs are based on motor horsepower necessary to operate the surface skimmer and pressurization pump.

The wastewater transfer pump costs are based on influent wastewater flow rate. Pumps are designed to operate at a flow rate of one-half the stated maximum capacity of the pump. Electricity costs are based on motor horsepower necessary to transfer wastewater at the influent wastewater flow rates.

The chemical treatment tank system consists of a treatment tank, mixer, pH probe, acid metering pump, and caustic metering pump. The treatment tank costs are based on the ratio of tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The mixer costs are based on tank volume and motor horsepower necessary to operate the mixer. The pH probe and acid metering pump costs are the same for every facility. The caustic metering pump costs are based on tank volume. Sulfuric acid (93%) and sodium hydroxide (50%) are added to the wastewater. The volume of chemicals added is based on the ratio of chemical addition to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The polymer mixing tank system consists of a mixing tank, a mixer, and two metering pumps. The tank costs are based on the ratio of mixing tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The mixer costs are based on tank volume and motor horsepower necessary to operate the mixer. The metering pump cost is the same for every facility. The polymer dilution tank system consists of the same components as the polymer mixing tank system except it includes only one metering pump. Polymer addition rates are based on the ratio of polymer addition to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The sludge storage tank costs are based on the ratio of sludge storage tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. Sludge is collected in the storage tank before being dewatered. Costs for sludge dewatering are estimated in the sludge dewatering module (see Section 10.3.18). The DAF unit sludge generation rates are based on information gathered during EPA site visits and sampling episodes at TEC facilities with DAF units.

The pH adjustment and DAF units are housed in the pre-engineered building to provide protection from poor weather conditions. The pre-engineered building costs are based on the square footage of building space needed to house the DAF unit and associated equipment.

Since differences in the sizes of equipment housed in the pre-engineered building are minor, costs for all facilities are estimated for the same building size.

10.3.10 DAF (without Chemical Addition)

In this module, EPA estimates costs for a facility to install and operate a DAF unit designed to remove entrained solid or liquid particles. The module calculates the costs necessary to operate a DAF unit and collect solids for disposal off site (for facilities with treatment in place but no sludge dewatering on site) or for on-site sludge dewatering.

Capital and annual costs for the following equipment are included in this DAF module:

- A DAF unit; and
- A sludge storage tank.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal (if sludge dewatering costs are not included). The DAF unit costs are based on the ratio of DAF unit capacity to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. Electricity costs are based on the motor horsepower necessary to operate the DAF unit.

A sludge storage tank is only included in baseline options where a facility does not operate sludge dewatering on site. A sludge storage tank is sized to hold the volume of sludge collected over a period of one month. Waste disposal costs are calculated separately in the waste haul module (see Section 10.3.21). The sludge storage tank costs are based on volume. The DAF module calculates the amount of sludge to be disposed based on the ratio of DAF sludge generation rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. EPA assumes that the DAF sludge comprises 4% solids, based on assumptions used in the MP&M cost model.

10.3.11 Chemical Precipitation

EPA conducted an abbreviated cost review to determine the feasibility of installing and operating chemical precipitation treatment at facilities in the Truck/Petroleum and Rail/Petroleum Subcategories. Based on the results of this review and information currently available to EPA, the Agency believes that this technology does not provide adequate and/or cost-effective treatment of TEC wastewaters at facilities in the Truck/Petroleum and Rail/Petroleum Subcategories. EPA does not currently have sampling data for chemical precipitation units operated at TEC facilities. All cost estimates for chemical precipitation treatment of TEC wastewater are based on chemical precipitation costs developed for EPA's Industrial Laundries Effluent Limitations Guidelines program.

In this module, EPA estimates costs for a facility to install and operate a chemical precipitation unit to remove dissolved metals and entrained solid or liquid particles from raw wastewater. The cost estimate includes the costs necessary to perform batch chemical precipitation treatment and to remove, store, and dispose of settled sludge.

Capital and annual costs for the following equipment are included in the chemical precipitation unit module:

- A mixing/settling tank;
- Three chemical feed systems;
- An agitator;
- An effluent pump;
- A sludge pump;
- A sludge holding tank; and
- A control system.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, chemicals, and settled solids disposal. The chemical precipitation unit operates in batch mode, and EPA assumes that the system treats one batch per day (i.e., treatment of one day's wastewater). Electricity costs for agitators, chemical transfer pumps (polyalum chloride, anionic polymer, and cationic polymer), and the effluent pump are based on motor horsepower necessary to operate the unit and chemical or wastewater transfer rates needed to operate the unit.

Sludge is collected from the chemical precipitation sludge storage tank once per month. Sludge disposal costs are the same throughout the TECI cost model. The sludge generation rate is estimated using the difference between the influent and effluent average total suspended solids concentrations. EPA assumes that the precipitation sludge stream comprises 5.7% solids, based on engineering literature.

10.3.12 Filter Press (for Wastewater Clarification and Biological Treatment Sludge Dewatering)

In this module, EPA estimates costs for a facility to install and operate a single filter press for two operations: wastewater clarification and biological treatment sludge dewatering. During wastewater treatment operating hours, the filter press functions as a wastewater clarifier. Following wastewater treatment operating hours, the filter press dewaters sludge from biological treatment. The module calculates the costs necessary to filter and store wastewater before being discharged or pumped to subsequent treatment units. The module also calculates annual costs associated with sludge dewatering. The filter press is designed to treat one batch of wastewater per day and one batch of biological treatment sludge per day.

Capital and annual costs for the following equipment are included in the filter press module:

- An influent pump and compressor;
- A diatomaceous earth precoat tank;
- A diatomaceous earth precoat pump and compressor;
- A filter press; and
- An effluent storage tank.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal. Based on observations made during EPA site visits and sampling episodes, EPA assumes that both operations generate equal daily volumes of dewatered sludge. Dewatered sludge volumes are based on the ratio of dewatered sludge generation rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The filter press volume is based on and equal to the volume of dewatered sludge from just one of the operations. Waste disposal costs are calculated separately in the waste haul module (see Section 10.3.21) and are based on the total volume of dewatered sludge from both filter press operations. EPA assumes the dewatered filter cake volume comprises 32% solids, based on engineering literature.

The influent pump and precoat transfer pump costs are based on influent wastewater flow rate. Electricity costs for the pumps are based on motor horsepower necessary to transfer wastewater and polymer at the flow rates estimated by the filter press module.

The diatomaceous earth precoat tank costs and effluent storage tank costs are based on tank volumes recommended by filter press vendors. The amount of diatomaceous earth necessary to treat wastewater and biological treatment sludge is based on the ratio of diatomaceous earth usage rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

10.3.13 Biological Treatment

In this module, EPA estimates costs for a facility to install and operate a biological oxidation unit used to decompose organic constituents. The module calculates costs necessary for operating an aerobic biological treatment unit consisting of two preaeration tanks, a post-treatment clarifier, and a sludge storage tank. A portion of the sludge is recycled by pumping the sludge from the clarifier to the second preaeration tank. Sludge is also pumped from the clarifier into a sludge storage tank for subsequent dewatering.

Capital and annual costs for the following equipment are included in the biological treatment module:

- Wastewater transfer pumps;
- Two preaeration tanks;
- Diffusers/blowers;
- A biological reactor tank;
- A clarifier;
- A sludge storage tank;
- A sludge pump; and
- A biological treatment effluent discharge pump.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, and residual disposal. The biological reactor capital and annual costs are based on a tank volume designed to provide a wastewater residence time of 4.6 days, as observed during EPA site visits and sampling episodes at TEC facilities. Annual additions of microorganisms to the biotreatment unit is based on the ratio of microorganism addition rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The wastewater transfer pump costs are based on influent wastewater flow rate. Electricity costs for the pumps are based on motor horsepower necessary to transfer wastewater at the influent flow rate. The diffuser/blower costs are based on the ratio of air flow rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The preaeration and sludge storage tank volumes are based on the ratio of tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities. The sludge and effluent discharge pump costs are based on motor horsepower necessary to transfer sludge and wastewater at the flow rates estimated by the biological treatment module.

The clarifier is used to settle sludge following the biological digestion in the biological reactor. Clarifier costs are based on the ratio of clarified volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

10.3.14 Activated Carbon Adsorption (Vessels)

In this module, EPA estimates costs for a facility to install and operate an activated carbon adsorption system used as a tertiary treatment technology applicable to waste streams following treatment by chemical oxidation, neutralization, coagulation, and clarification. The module calculates costs necessary for operating two activated carbon columns in series. Spent carbon is assumed to require off-site disposal once per month.

Capital and annual costs for the following equipment are included in the granular activated carbon module:

- A wastewater transfer pump; and
- Two carbon adsorption filters.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, chemicals (media changeout), and residual disposal. The capital and annual costs associated with the carbon adsorption filters are based on the ratios of activated carbon system size and carbon usage rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The costs associated with the wastewater transfer pump are based on influent wastewater flow rate. Electricity costs are based on motor horsepower necessary to operate the carbon adsorption system.

One column of spent activated carbon is assumed to be changed out once each month. Media change-out costs include costs for labor and fresh media. Spent carbon is assumed to be sent off site for regeneration. Residual disposal costs include costs for waste shipping and media disposal. For cost estimating purposes, EPA assumes that TEC facilities typically operate an average of 265 days per year. Costs are adjusted for facilities operating less than 265 days per year by multiplying "typical" residual disposal costs by a factor consisting of actual operating days divided by 265.

10.3.15 Activated Carbon Adsorption (Canisters)

In this module, EPA estimates costs for a facility to install and operate an activated carbon adsorption system for wastewater polishing followed by total recycle/reuse of TEC wastewater in TEC operations. The module calculates the costs necessary for disposal of spent carbon canisters.

Capital and annual costs for the following equipment are included in the carbon canisters module:

- An influent pump; and
- Carbon canisters.

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, replacement carbon canisters, and residual disposal costs. The activated carbon canister usage rate is calculated using wastewater flow rates, pollutant concentrations, and estimated carbon adsorption capacities for the pollutants in the wastewater. Annual carbon canister costs include labor to remove the spent carbon canister and install the new canister, transportation, and disposal of the spent carbon.

Influent pump costs are based on influent wastewater flow rate to the system. Electricity costs are based on motor horsepower necessary to transfer influent wastewater.

10.3.16 Organo-Clay/Activated Carbon Adsorption

In this module, EPA estimates costs for a facility to install and operate an organo-clay adsorption unit followed by a granular activated carbon unit for wastewater polishing. The module calculates costs to operate two columns in series (organo-clay followed by activated carbon) with nominal carbon change-out frequency of one vessel per month and nominal organo-clay change-out frequency of one vessel per two months.

Capital and annual costs for the following equipment are included in the organo-clay/activated carbon adsorption module:

- A wastewater transfer pump;
- An organo-clay vessel; and
- A granular activated carbon vessel.

Annual costs include operational labor, maintenance and repair labor, electricity, chemicals (media), and residual disposal. The costs associated with the organo-clay vessel and granular activated carbon vessels are based on the ratio of filter media volume to influent flow rate observed during EPA site visits and sampling episodes at TEC facilities.

The costs associated with the wastewater transfer pump are based on influent wastewater flow rate. The pump is designed to operate at a flow rate of one-half the stated maximum capacity of the pump. Electricity costs are based on motor horsepower necessary to transfer influent wastewater.

The design media change-out frequency is once per month for granular activated carbon, and once every two months for organo-clay, based on information provided by treatment system vendors. Spent carbon is assumed to be sent off site for regeneration or disposal and spent clay is assumed to be sent off site for incineration. Media change-out costs include costs for labor and fresh media. Residual disposal costs include costs for waste shipping and media disposal.

10.3.17 Reverse Osmosis

In this module, EPA estimates costs for a facility to install and operate a reverse osmosis unit for wastewater polishing. The module calculates costs necessary for wastewater storage prior to entering the reverse osmosis unit, and the reverse osmosis unit itself. The reverse osmosis unit is operated as a double pass unit. After the first pass through the reverse osmosis unit, the wastewater is transferred to a storage tank. When the storage tank is nearly full, the wastewater is pumped for a second pass through the reverse osmosis unit prior to discharge. Concentrate from the reverse osmosis unit is recycled to the first biological treatment preaeration tank.

Capital and annual costs for the following equipment are included in the reverse osmosis module:

- Two reverse osmosis wastewater storage tanks;
- A reverse osmosis flooded suction tank; and
- A reverse osmosis unit.

Annual costs include operational labor, maintenance and repair labor, electricity, and membrane and pretreatment filter replacement costs. The reverse osmosis unit capital costs are based on influent wastewater flow rate. Electricity costs are based on motor horsepower necessary to operate the unit at the flow rate estimated by the reverse osmosis module. Membrane and filter replacement costs are based on influent wastewater flow rate and information provided by treatment technology vendors. EPA estimates that membranes require replacement every five years, and the pretreatment filter cartridges must be replaced every two months.

The reverse osmosis wastewater storage tanks and flooded suction tank costs are based on the ratio of tank volume to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

10.3.18 Sludge Dewatering (Plate-and-Frame Filter Press)

In this module, EPA estimates costs for a facility to install and operate a plate-and-frame filter press. The module calculates costs necessary to operate a plate-and-frame filter press to dewater sludge that is generated by wastewater treatment units.

For the Truck/Chemical Subcategory, EPA assumes that facilities will use a portable pump to pump sludge from the sludge storage tanks into the filter press. Because EPA includes a portable pump in the oil/water separator module (see Section 10.3.4), costs are not included for an additional pump in the sludge dewatering module for the Truck/Chemical Subcategory.

Capital and annual costs for the following equipment are included in the plate-and-frame filter press module:

- A plate-and-frame filter press;
- Sludge transfer pumps (Rail/Chemical, Truck/Food, Rail/Food, and Barge/Food Subcategories);
- Sludge storage tank (PSES Option 1 for the Rail/Chemical Subcategory);
- Precoat (diatomaceous earth) tank (for dewatering biological treatment sludge); and
- Precoat transfer pump and compressor (for dewatering biological treatment sludge).

Annual costs include operational labor, maintenance and repair labor, O&M materials, electricity, chemical costs (diatomaceous earth), and residual disposal costs. The filter press capital and annual costs are calculated using the ratio of sludge generation rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities, as well as technical literature on sludge and filter cake solids contents. In general EPA assumes that the press operates one batch per day; therefore, the press volume generally equals the estimated daily volume of filter cake generation. However, for the Truck/Chemical and Rail/Chemical Subcategories, EPA performed an optimization analysis to determine filter press volume versus the number of batches per day based on the filter cake generation rate and operational days per year. EPA assumes that the filter press will operate no more than two batches per day. The cost for hauling dewatered sludge is estimated separately in the waste haul module (see Section 10.3.21) and is based on the calculated volume of dewatered sludge generated. EPA assumes that the dewatered sludge comprises 32 to 33% solids, based on engineering literature.

The sludge transfer pump costs are based on motor horsepower necessary to transfer sludge at flow rates estimated by the sludge dewatering module. The precoat transfer pump costs are based on influent wastewater flow rate. Electricity costs are based on motor horsepower necessary to transfer polymer at flow rates estimated by the sludge dewatering module.

The diatomaceous earth precoat tank costs are based on tank volumes recommended by filter press vendors. The amount of diatomaceous earth necessary is based on the ratio of diatomaceous earth usage rate to wastewater flow rate observed during EPA site visits and sampling episodes at TEC facilities.

10.3.19 Contract Hauling of Wastewater in Lieu of Treatment

In this module, if contract hauling in lieu of treatment is appropriate, capital and annual costs for a wastewater holding tank are included in the module. Annual costs include maintenance and repair labor, O&M materials, transportation, and disposal of wastewater. EPA assumes that wastewater would be accumulated in a holding tank and then disposed off site every three months. Holding tank costs are based on the tank volume needed to contain all of the wastewater generated by a facility over a three-month period.

Transportation disposal costs are based on gallons of wastewater to be disposed. EPA uses quotes from nation-wide vendors to estimate costs for contract hauling wastewater off site. EPA estimates a cost of $0.44/gallon (7) to contract haul wastewater off site.

10.3.20 Compliance Monitoring

This practice is included in all of the proposed regulatory options for all subcategories. Regulatory options were not developed by EPA for BPT, BCT, BAT, and NSPS for facilities in the Truck/Petroleum and Rail/Petroleum Subcategories.

In this module, EPA estimates annual compliance monitoring costs for all TEC facilities. The annual cost calculated by the model for compliance monitoring included laboratory costs to analyze wastewater volatile and semivolatile organics, metals, and classical pollutants. For indirect dischargers, EPA estimates costs for facilities to monitor monthly for all regulated pollutants. For direct dischargers, EPA estimates costs for facilities to monitor weekly for classical pollutants and monthly for volatile and semivolatile organics and metals. However, for the food subcategories direct dischargers, EPA estimates costs for facilities to monitor weekly for classical pollutants, with no monitoring for any other pollutants, because EPA is regulating only these pollutants in the food grade subcategories. The costs for each type of analysis per sample were obtained from a laboratory contracted by EPA on past wastewater sampling efforts. The table below shows the monitoring costs used in the cost model.

Analytical Method	Laboratory Fee ($1994)	Reference
Method 1624 - Volatile Organic Compounds	$459	(8)
Method 1625 - Semi-Volatile Organic Compounds	$1040.40	(8)
Method 1620 - Metals	$598	(8)
Methods 405.1, 410.4, 335.1, 1664, 150.1, 415.1, 420.2 - Classical Pollutants	$177	(8)

10.3.21 Waste Hauling

In this module, where applicable, EPA estimates annual waste hauling costs for oil (95% oil), undewatered sludge (approximately 4% solids), and dewatered sludge (approximately 32% solids) for all TEC facilities. The cost model calculates annual costs for waste hauling, including labor and transportation. Cost rates are obtained from nation-wide vendors. Undewatered sludge disposal costs are based on using either a vac-truck or multiple drums, depending on the volume to be disposed. Dewatered sludge costs include an annual roll-off box rental.

10.4 Summary of Costs by Regulatory Option

Table 10-5 summarizes estimated BPT, BCT, and BAT compliance costs by regulatory option. Table 10-6 summarizes estimated PSES compliance costs by regulatory option. Costs shown include capital and O&M costs (including energy usage) totaled for each subcategory for all discharging facilities. All costs represent the estimated incremental compliance costs to the industry. The capital costs shown in Tables 10-5 and 10-6 represent the direct capital costs estimated by the technology modules plus the indirect capital costs discussed in Section 10.2.4.1. The annual costs shown in Tables 10-5 and 10-6 represent the direct annual costs estimated by the technology modules plus the compliance monitoring and waste hauling costs discussed in Sections 10.3.20 and 10.3.21.

10.5 References[1]

1. U.S. Environmental Protection Agency, Office of Water. Economic Analysis for the Proposed Effluent Limitations Guidelines for the Transportation Equipment Cleaning Industry. EPA-821-B-98-012, May 1998.

[1] For those references included in the administrative record supporting the proposed TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

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7. Eastern Research Group, Inc. Contract Haul Cost Module Documentation for the Transportation Equipment Cleaning Cost Model. May 1998 (DCN T09754).

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16. Eastern Research Group, Inc. Biological Treatment Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09736).

17. Eastern Research Group, Inc. Activated Carbon Adsorption Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Truck/Chemical Subcategory. May 1998 (DCN T09733).

18. Eastern Research Group, Inc. Oil/Water Separation Cost Module Documentation for the Transportation Equipment Cleaning Cost Model Rail/Chemical Subcategory (Direct Dischargers). May 1998 (DCN T09741).

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Table 10-1

Number of Costed Technology Options for Each TECI Subcategory

Subcategory	Number of Technology Options
Truck/Chemical	4
Rail/Chemical	6
Barge/Chemical & Petroleum	3
Truck/Food	2
Rail/Food	2
Barge/Food	2
Truck/Petroleum	1
Rail/Petroleum	1
Truck/Hopper	1
Rail/Hopper	1
Barge/Hopper	1

Table 10-2

Direct Capital Costs Used by the TECI Cost Model

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Cleaning bays	C = 65,000 - 74,928 for 1 bay (based on tank type) C = 80,000 - 82,798 for 2 bays (based on tank type) C = 150,000 - 165,596 for 4 bays (based on tank type)	Truck/Chemical Rail/Chemical	Flow Reduction	(5)
Spinners and covers (2)	C = 10,000	Truck/Chemical Rail/Chemical	Flow Reduction	(5)
Equalization tank	C = 1.002(V) + 4,159.944	Truck/Chemical Truck/Food Rail/Food Barge/Food Truck/Petroleum Rail/Petroleum	Equalization	(9,33,37)
Equalization tank mixer/aerator	C = 463 for V <16,667 C = 573 for V <33,333 C = 804 for V $\geq$33,333	Truck/Chemical Truck/Food Rail/Food Barge/Food Truck/Petroleum Rail/Petroleum	Equalization	(9,33,37)
Demulsifier pump	C = 1,529	Truck/Chemical Truck/Petroleum Rail/Petroleum	Oil/Water Separator	(10,11,38)
Oil/water separator (vertical tube coalescing)	C = -0.926(GPM)^2 + 247.9(GPM) + 6,209	Truck/Chemical Truck/Petroleum Rail/Petroleum	Oil/Water Separator	(10,11,38)

Table 10-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Oil storage tank	C = 0.874(V) + 202.45	Truck/Chemical Barge/Chemical Truck/Petroleum Rail/Petroleum	Oil/Water Separator	(10,11,27,38)
Sludge transfer pump	C = 2,102 for GPM $\leq$ 2 C = 1,602 for GPM >2	Truck/Chemical Truck/Hopper Rail/Hopper Barge/Hopper Truck/Food Rail/Food Barge/Food Truck/Petroleum Rail/Petroleum	Oil/Water Separator, Gravity Separation	(10,11,34,38, 41)
Sludge storage tank	C = 0.846(V) + 355.163	Truck/Chemical Truck/Petroleum Rail/Petroleum	Oil/Water Separator	(10,11,38)
Chemical oxidation/coagulation/ clarification system	C = -3.885(GPM)^2 + 1,374.588(GPM) + 49,978.01	Truck/Chemical	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12,13)
Polyalum chloride storage tank	C = 6,698	Truck/Chemical	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12,13)

Table 10-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Plate-and-frame filter press	$C = -6.244(FCV)^2 + 1{,}527.685(FCV) + 10{,}379.655$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Filter Press, Sludge Dewatering	(14,15,23,24, 28,29,30,36)
Wastewater pump (influent to carbon adsorption system)	$C = -0.11(GPM)^2 + 31.706(GPM) + 562.079$	Truck/Chemical Truck/Petroleum Rail/Petroleum	Activated Carbon Adsorption	(17,39)
Activated carbon adsorption vessels (2 vessels)	$C = 12.237(ACV)^{1.026}$	Truck/Chemical	Activated Carbon Adsorption	(17)
Wastewater transfer pump	$C = 0.0124(GPM)^3 - 0.985(GPM)^2 + 23.352(GPM) + 847.032$	Rail/Chemical Barge/Chemical Truck/Hopper Rail/Hopper Barge/Hopper	Oil/Water Separation, pH Adjustment, Gravity Separation, Organo-Clay/Activated Carbon Adsorption	(18,19,21,22, 26,41)
Oil transfer pump	$C = 0.0124(GPM)^3 - 0.985(GPM)^2 + 23.352(GPM) + 847.032$	Rail/Chemical Barge/Chemical	Oil/Water Separation	(18,19,27)
Oil/water separator (API)	$C = -0.312(GPM)^2 + 277.123(GPM) + 38{,}266.407$	Rail/Chemical	Oil/Water Separation	(18,19)
Oil storage tank	$C = 1.949(V) + 573.468$ for $V>185$ gallons $C = 970$ for $V \leq 185$ gallons	Rail/Chemical	Oil/Water Separation	(18,19)
Sludge storage tank	$C = 2.668(V) + 154.792$ for $V>55$ gallons $C = 193$ for $V \leq 55$ gallons	Rail/Chemical	Oil/Water Separation	(18,19)
Equalization tank	$C = -0.000017(V)^2 + 1.185(V) + 673.73$	Rail/Chemical	Equalization	(20)

Table 10-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Equalization tank agitator	$C = 2827.932LOG_{10}(HP) + 4,604.077$	Rail/Chemical	Equalization	(20)
Chemical addition tank and polymer mixing tank	$C = 4.27(V) + 684.194$	Rail/Chemical	pH Adjustment, DAF	(21,22)
Chemical addition tank mixer	$C = 1.162(V) + 622.232$	Rail/Chemical	pH Adjustment	(21,22)
pH probe	C = 1,177.70	Rail/Chemical	pH Adjustment	(21,22)
Acid addition pump	C = 316.8	Rail/Chemical	pH Adjustment	(21,22)
Caustic addition pump	C = 316.8 for $V \leq 450$ gallons C = 371.8 for $V > 450$ gallons	Rail/Chemical	pH Adjustment	(21,22)
Polymer mixing tank mixer	$C = 1.071(V) + 610.915$	Rail/Chemical	DAF	(21,22)
Polymer pump	C = 697.2 for polymers 7622 and 7181 C = 686 for polymer 7032	Rail/Chemical	DAF	(21,22)
Polymer dilution tank	$C = 0.00038(V)^3 - 0.18828(V)^2 + 32.308(V) - 554.286$	Rail/Chemical	DAF	(21,22)
Polymer dilution tank mixer	$C = 3.38(V) + 566.510$	Rail/Chemical	DAF	(21,22)
DAF unit	$C = -1.357(GPM)^2 + 291.471(GPM) + 68,163.591$	Rail/Chemical	DAF	(21,22)
DAF compressor	$C = 245.317(HP) + 1,998.279$	Rail/Chemical	DAF	(21,22)
Sludge storage tank	$C = 2.587(V) + 159.528$	Rail/Chemical	DAF	(21,22)
Pre-engineered building	C = 19,450.08	Rail/Chemical	DAF	(21,22)
Sludge transfer pump	$C = -22.288(HP)^2 + 327.219(HP) + 1,827.999$	Rail/Chemical	Oil/Water Separation, Sludge Dewatering	(18,23,24)

Table 10-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Sludge storage tank	C = 15,678.49LOG_{10}(V) - 40,333.095	Rail/Chemical	Sludge Dewatering	(24)
Organo-clay/activated carbon vessels	C = 2.922$(FMC)^2$ + 169.642(FMC) + 3,825.433	Rail/Chemical	Organo-Clay/Granular Activated Carbon	(26)
Oil/water separator(gravity separation)	C = 0.234(V) + 16,153	Barge/Chemical	Oil/Water Separation	(27)
Oil/water separator effluent pump, precoat pump, and filter press influent pump	C = 1,928.46 for GPM<2 C = 2,015.98 for GPM<4 C = 2,226.1 for GPM<7.5 C = 3,371.21 for GPM<15 C = 4,784.05 for GPM<30 C = 6,696.73 for GPM≥30	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Oil/Water Separator, Filter Press, Sludge Dewatering	(14,23,27,28, 29,30,36)
DAF unit	C = 46,000 for GPM<53 C = 68,500 for GPM≥53	Barge/Chemical	DAF	(27)
Sludge storage tank	C = 0.917(V) + 322.7	Barge/Chemical	DAF	(27)
Filter press wastewater effluent storage tank	C = 0.526(V) + 3,246.142	Barge/Chemical	Filter Press	(29,30)
Precoat storage tank	C = 4,160 for FPV <10 C = 4,544 for FPV <30 C = 5,078 for FPV <50 C = 6,980 FPV <100 C = 10,284 for FPV ≥100	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Filter Press, Sludge Dewatering	(14,23,28,29, 30,36)

Table 10-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Wastewater transfer pump/oil transfer pump (operating at maximum capacity)	$C = 0.0015(GPM)^3 - 0.2463(GPM)^2 + 11.6758(GPM) + 847.0323$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Oil/Water Separation, Biological Treatment	(16,25,31,34, 35)
Preaeration tank	$C = 0.578(V) + 2,142.109$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Biological Treatment	(16,25,31,35)
Diffusers/blowers	$C = 23.443(FT3M) + 787.24$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Biological Treatment	(16,25,31,35)
Biological reactor tank	$C = -0.371(V/1,000)^2 + 475.133(V/1,000) + 2,3000.696$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Biological Treatment	(16,25,31,35)

Table 10-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Clarifier	$C = 0.331(GPM)^2 + 143.329(GPM) + 21,838.385$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Biological Treatment	(16,25,31,35)
Sludge storage and reverse osmosis storage tank	$C = 0.733(V) + 12,170.856$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Biological Treatment, Reverse Osmosis	(16,25,31,32, 35)
Sludge transfer pump	$C = 209.82(HP) + 1,888.2$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Biological Treatment, Sludge Dewatering	(16,25,31,35, 36)
Wastewater pump (effluent from biological treatment)	$C = 3.383(HP)^2 + 64.263(HP) + 1,024.711$	Truck/Chemical Rail/Chemical Barge/Chemical Truck/Food Rail/Food Barge/Food	Biological Treatment	(16,25,31,35)
Flooded suction tank	$C = -0.0003(V)^2 + 2.9356(V) + 118.68$ for $V \geq 55$ $C = 193$ for $V < 55$	Barge/Chemical	Reverse Osmosis	(32)
Reverse osmosis unit	$C = -13.578(GPM)^2 + 2,600.9(GPM) + 4,773.9$	Barge/Chemical	Reverse Osmosis	(32)

Table 10-2 (Continued)

Capital Costs				
Item	**Cost Equation ($1994)**	**Subcategory(ies)**	**Technology(ies)**	**Reference**
Gravity separator	$C = -0.00002(V)^2 + 1.165(V) + 4748.36$ for $V<21,808$ $C = 0.00000006(V)^2 + 0.2849(V) + 10,738$ for $V \geq 21,808$	Truck/Hopper Rail/Hopper Barge/Hopper Truck/Food Rail/Food Barge/Food	Oil/Water Separator, Gravity Separation	(34,41)
Carbon canister	C = 883	Truck/Petroleum Rail/Petroleum	Activated Carbon Adsorption	(39)

ACV - Activated carbon vessel volume (cubic feet).
API - American Petroleum Institute.
C - Direct capital equipment costs ($1994).
DAF - Dissolved Air Flotation.
FCV - Filter cake volume (cubic feet per day).
FMC - Filter media vessel volume (cubic feet).
FT3M - Flow rate (cubic feet per minute).
GPM - Flow rate (gallons per minute).
HP - Motor horsepower (hp).
FPV - Filter press volume (cubic feet).
V - Tank volume (gallons).

Table 10-3

Components of Total Capital Investment

Item	Component	Cost
1	Equipment capital costs (including required accessories), installation, delivery, electrical and instrumentation, enclosure, and pumping	Direct Capital Cost
2	Piping	10% of item 1
3	Secondary containment/land costs	10% of item 1
4	Excavation and site work	3.5% of item 6
5	Indirect costs including: engineering and supervision, construction expenses, contractor's fee, and contingency	20% of item 6
6	Total Capital Investment (equals fixed capital investment)	Sum of items 1 through 5 = **1.57 × Direct Capital Cost**

Source: Transportation Equipment Cleaning Design and Cost Model.

Table 10-4

Operation and Maintenance Unit Costs Used by the TECI Cost Model

Item	Cost ($1994)/ Cost Equation ($1994)	Practice/ Technology	Reference
Activity			
Contract hauling of bulk wastewater	$0.44/gallon	Contract Haul	(7)
Disposal of waste oil (95% oil, 5% water)	$0.37/gallon	Contract Haul	(7)
Nonhazardous dewatered sludge disposal	$141.01/yd^3 + $4,176/yr for roll-off box rental	Contract Haul	(7)
Nonhazardous undewatered sludge disposal	$0.53-$3.58/gallon (based on volume)	Contract Haul	(7)
Laboratory fee for volatile organic compounds	$459/analysis	Compliance Monitoring	(8)
Laboratory fee for semivolatile organic compounds	$1040.40/analysis	Compliance Monitoring	(8)
Laboratory fee for metals	$598/analysis	Compliance Monitoring	(8)
Laboratory fee for classical pollutants	$177/analysis	Compliance Monitoring	(8)
Chemicals			
Activated carbon (annual media change-out and regeneration)	A = 0.00112(ACV)^2 + 11.663(ACV) + 11058.543	Activated Carbon Adsorption	(17)
Biological treatment microbes	$2.84/lb	Biological Treatment	(16, 25, 31, 35)
Activated carbon canister (annual change-out and regeneration)	$842.70/canister	Activated Carbon Adsorption	(39)
Demulsifier	$33.36/gallon	Oil/Water Separator	(10, 11, 38)
Diatomaceous earth	$0.76/lb	Filter Press, Sludge Dewatering	(14, 23, 28, 29, 30, 36)
Organo-clay/activated carbon adsorption (annual media change-out)	A = -1.785(FMV)^2 + 946.009(FMV) - 450.496	Organo-Clay/Activated Carbon Adsorption	(25)
Organo-clay/activated carbon disposal (organo-clay incineration and activated carbon regeneration)	A = 161.429(FMV) + 8464.083	Organo-Clay/Activated Carbon Adsorption	(26)

Table 10-4 (Continued)

Item	Cost ($1994)/ Cost Equation ($1994)	Practice/ Technology	Reference
Hydrogen peroxide	$0.45-$0.69/lb	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Magnesium hydroxide	$0.26-$0.36/lb	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Polyalum chloride	$2.53-$4.28/gallon	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Polymer	$2.65-$3.00/lb	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Polymer 7032	$1.10/lb	DAF	(21, 22)
Polymer 7181	$4.45/lb	DAF	(21, 22)
Polymer 7622	$1.25/lb	DAF	(21, 22)
Sodium hydroxide (50%)	$1.689/gallon	pH Adjustment	(21, 22)
Sulfuric acid (93%)	$0.095-$0.28/lb $1.091/gallon	Chemical Oxidation, Neutralization, Coagulation, Clarification, and pH Adjustment	(12, 13, 21, 22)
Labor Costs			
Flow reduction training	A = (FPT-REG)(0.5)(25.9) for truck and barge tank type (where A $\leq$ 34188 for the Barge/Chemical and Barge/Food Subcategories and A $\leq$ 10360 for the Barge/Hopper Subcategory) A=(FPT-REG)(0.5)(25.9)/(1.7) for rail tank type	Flow Reduction	(5)
Pump operational labor	A = (0.05)(DPY)(25.9)	All	(42)
Pump maintenance labor	A = (0.005)(DPY)(HPD)(25.9)	All	(42)
Oil/water separator (vertical tube coalescing) operational labor	A = (0.05)(DPY)(25.9)	Oil/Water Separator	(10, 11, 38)
Oil/water separator (vertical tube coalescing) maintenance labor	A = (0.005)(HPD)(DPY)(25.9) + ((48)(25.9))	Oil/Water Separator	(10, 11, 38)

Table 10-4 (Continued)

Item	Cost ($1994)/ Cost Equation ($1994)	Practice/ Technology	Reference
Tanks with mixers maintenance labor	A = 103.6 -207.2 (based on tank volume)	Equalization, pH Adjustment, Filter Press, DAF, Biological Treatment, Sludge Dewatering	(9, 14, 20, 21, 22, 23, 28, 29, 30, 31, 33, 36, 37, 43)
Tanks without mixers maintenance labor	A = 414.4 - 828.8 (based on tank volume)	All	(43)
Tank(all) repair labor	A = (0.01)(C)	All	(43)
Filter press operational labor	A = (BPY)(12.95) - (BPY)(25.9) (based on filter press volume)	Filter Press, Sludge Dewatering	(14, 15, 23, 24, 28, 29, 30, 36)
DAF operational labor	A = (1)(DPY)(25.9) - (2)(DPY)(25.9) (based on chemical addition)	DAF	(21, 22, 27)
DAF maintenance and repair labor	A = (0.01)(C) - (0.02)(C) (based on chemical addition)	DAF	(21, 22, 27)
Chemical oxidation, neutralization, coagulation, clarification operational labor	A = (HPD)(DPY)(25.9)	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Chemical oxidation, neutralization, coagulation, clarification maintenance and repair labor	A = (32)(25.9)	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Activated carbon unit repair labor	A = (0.01)(C)	Activated Carbon Adsorption	(17)
pH probe maintenance and repair labor	A = (2)(0.01)(C)	pH Adjustment	(21, 22)
Organo-clay/granular activated carbon unit repair labor	A = (0.01)(C)	Organo-Clay/Activated Carbon Adsorption	(25)
Reverse osmosis operational labor	A = (DPY)(25.9)	Reverse Osmosis	(32)
Reverse osmosis maintenance labor	A = 414.4	Reverse Osmosis	(32)
Oil/water separation (API) maintenance labor	A = 414.4	Oil/Water Separation	(18, 19)
Material and Replacement Costs			
Pump materials	A = (0.01)(C)	All	(42)

Table 10-4 (Continued)

Item	Cost ($1994)/ Cost Equation ($1994)	Practice/ Technology	Reference
Chemical oxidation/ neutralization/coagulation/ clarification materials	A = (0.01)(C)	Chemical Oxidation, Neutralization, Coagulation, Clarification	(12, 13)
Demulsifier pump materials	A = 15	Oil/Water Separation	(10, 11, 38)
Oil/water separator (vertical tube coalescing) materials	A = 8-25 (based on wastewater flow)	Oil/Water Separation	(10, 11, 38)
Filter press materials	A = (0.01)(C)	Filter Press Sludge Dewatering	(14, 15, 23, 24, 28, 29, 30, 36)
DAF (with chemical addition) materials	A = (0.01)(C)	DAF	(21, 22)
Annual costs for a building	A = (0.035)(C)	DAF	(21, 22)
pH probe materials	A = 185/0.75	pH Adjustment	(21, 22)
Filter press precoat storage tank materials	A = (0.01)(C)	Filter Press, Sludge Dewatering	(14, 23, 28, 29, 30, 36)
Reverse osmosis membrane replacement	$A = -1.409(GPM)^2 + 142.64(GPM) + 707.27$	Reverse Osmosis	(32)
General Costs			
Electricity usage fee	$0.047/ kilowatt-hour	All	(4)
O&M labor rate	$25.90/hour	All	(3)
Water usage fee	$2.98/1,000 gal of water	Flow Reduction	(5)

A - Annual costs ($1994/year).
ACV - Activated carbon vessel volume (cubic feet).
BPY - Filter press batches per year.
C - Direct capital equipment costs ($1994).
DPY - Operating days per year.
DAF - Dissolved Air Flotation.
FMV - Filter media vessel volume (cubic feet).
FPT - Flow per tank (gallons).
GPM - Flow rate (gallons per minute).
HPD - Operating hours per day.
REG - Subcategory regulatory flow per tank (gallons).
X - Tank volume (gallons).

Table 10-5

Cost Summary of Regulatory Options for BPT/BAT/BCT (a)

Subcategory	Option	Capital Cost (Thousand $1994)	O&M Cost (Thousand $/yr (in $1994))
Barge/Chemical	1	$3,200	$1,900
Barge/Chemical	2	$4,800	$2,100
Rail/Chemical	1	$113	$42
Rail/Chemical	2	$272	$72.9
Rail/Chemical	3	$282	$29.9
Truck/Chemical	1	$134	$104
Truck/Chemical	2	$134	$104
Truck/Food (b)	1	$0	$0
Truck/Food (b)	2	$0	$0
Barge/Food (b)	1	$0	$0
Barge/Food (b)	2	$0	$0
Barge/Hopper	1	$160 (c)	$480 (c)

Source: Output from the Transportation Equipment Cleaning Industry Design and Cost Model.

(a) Costs are based on monthly monitoring for regulated toxic pollutants and weekly monitoring for conventional pollutants (see (c)).
(b) All direct dischargers in these subcategories currently operate oil/water separation, equalization, and biological treatment and are expected to meet the pollutant discharge long-term averages without incurring any additional capital or annual costs.
(c) Costs are based on only monthly monitoring for all pollutants.

Table 10-6

Cost Summary of Regulatory Options for PSES (a)

Subcategory	Option	Capital Cost (Thousand $1994)	O&M Cost (Thousand $/yr (in $1994))
Barge/Chemical	1	$110	$220
Barge/Chemical	2	$320	$240
Barge/Chemical	3	$430	$220
Rail/Chemical	1	$4,400	$1,400
Rail/Chemical	2	$10,500	$1,600
Rail/Chemical	3	$11,000	$2,600
Truck/Chemical	1	$43,500	$15,400
Truck/Chemical	2	$53,600	$24,700
Barge/Food	1	$0	$30.6
Barge/Food	2	$30.2	$61.6
Rail/Food	1	$4,710	$2,520
Rail/Food	2	$41,100	$3,340
Truck/Food	1	$13,400	$3,500
Truck/Food	2	$55,300	$5,510
Barge/Hopper	1	$0	$26
Rail/Hopper	1	$0	$28
Truck/Hopper	1	$310	$390
Rail/Petroleum and Truck/Petroleum (b)	2	$1,800	$830

Source: Output from the Transportation Equipment Cleaning Design and Cost Model.

(a) Costs are based on monthly monitoring of all regulated pollutants.
(b) Rail/Petroleum and Truck/Petroleum Subcategories are combined for reporting purposes.

11.0 POLLUTANT REDUCTION ESTIMATES

This section describes EPA's estimates of industry pollutant loadings and pollutant reductions for each of the Transportation Equipment Cleaning Industry (TECI) technology options described in Section 9.0. The Agency estimated pollutant loadings and pollutant reductions from TEC facilities in order to evaluate the impact of pollutant loadings currently released to surface waters and publicly-owned treatment works (POTWs), to evaluate the impact of pollutant loadings released to surface waters and POTWs following implementation of each proposed TECI regulatory option, and to assess the cost-effectiveness of each TECI regulatory option in achieving these pollutant loading reductions. Untreated, baseline, and post-compliance pollutant loadings and pollutant reductions were estimated for the pollutants effectively removed for each TECI subcategory. The identification of pollutants effectively removed is discussed in Section 7.0. Untreated, baseline, and post-compliance pollutant loadings are defined as follows:

- Untreated loadings - pollutant loadings in raw transportation equipment cleaning (TEC) wastewater. These loadings represent pollutant loadings generated by the TECI, and do not account for wastewater treatment currently in place at TEC facilities.

- Baseline loadings - pollutant loadings in TEC wastewater currently being discharged to POTWs or U.S. surface waters. These loadings account for wastewater treatment currently in place at TEC facilities.

- Post-compliance loadings - pollutant loadings in TEC wastewater that would be discharged following implementation of each regulatory option. These loadings are calculated assuming that all TEC facilities would operate wastewater treatment technologies equivalent to the technology bases for the regulatory options evaluated.

The following information is presented in this remainder of this chapter:

- Section 11.1 presents the general methodology used to calculate TECI pollutant loadings and pollutant reductions;

- Section 11.2 presents the general methodology used to estimate untreated pollutant loadings in TEC wastewaters;
- Section 11.3 presents methodology used to estimate untreated production normalized pollutant loadings (PNPLs) in TEC wastewaters for multiple subcategory facilities;
- Section 11.4 presents the estimated untreated pollutant loadings for the TECI;
- Section 11.5 presents the estimated baseline pollutant loadings for the TECI;
- Section 11.6 presents the estimated post-compliance pollutant loadings for the TECI;
- Section 11.7 presents the estimated pollutant loading reductions achieved by the TECI following implementation of each regulatory option; and
- Section 11.8 presents references for this section.

11.1 General Methodology Used to Calculate Pollutant Loadings and Pollutant Reductions

In general, pollutant loadings and pollutant reductions were calculated for the TECI using the following methodology:

1. Field sampling data were analyzed to determine pollutant concentrations in untreated TEC wastewaters.
2. These concentrations were converted to untreated production normalized pollutant loadings (PNPLs) for each TECI subcategory using the sampled facility production data (i.e., the number of tanks cleaned), wastewater flow rates, and operating data.
3. Untreated PNPLs were used in the TECI cost model (see Section 10.0) to estimate the loading of each pollutant in each model facility untreated TEC wastewater stream.

4. Model facility daily untreated pollutant loadings were converted to untreated influent concentrations using facility flow data and a conversion factor.

5. Model facility untreated pollutant loadings and statistically generated weighting factors were used to calculate untreated wastewater pollutant loadings for the TECI and each TECI subcategory.

6. Treated effluent concentrations, or treatment effectiveness concentrations, that are achieved by treatment technologies that comprise each TECI regulatory option were developed using analytical data collected during EPA's TECI sampling program (see Section 7.0).

7. The TECI cost model calculated the pollutant loadings and pollutant loading reductions achieved at baseline. For facilities that have existing treatment, the cost model compared the untreated TEC wastewater influent concentrations to the treatment effectiveness concentrations achieved by existing treatment, and determined the pollutant reductions achieved by the existing treatment.

8. The baseline pollutant concentrations were converted to baseline pollutant loadings using facility flow rates and a conversion factor.

9. TECI and TECI subcategory baseline pollutant loadings were calculated for each regulatory option using the model facility baseline pollutant loadings and statistically generated weighting factors.

10. The TECI cost model calculated the post-compliance pollutant loadings and pollutant reductions achieved by each regulatory option. As discussed in Section 9.0, each TECI regulatory option is comprised of a set of pollutant control technologies. For each facility, the cost model compared the pollutant concentrations in the wastewater influent to the regulatory option treatment unit to the treatment effectiveness concentration achieved by the treatment unit, and determined the pollutant reductions achieved.

11. The post-compliance pollutant concentrations were converted to post-compliance pollutant loadings using facility flow rates and a conversion factor.

12. TECI and TECI subcategory post-compliance pollutant loadings were calculated for each regulatory option using the model facility post-compliance pollutant loadings and statistically generated weighting factors.

13. For each model facility, the pollutant reductions achieved by each regulatory option were calculated by subtracting the post-compliance pollutant loadings from the baseline pollutant loadings.

14. TECI and TECI subcategory pollutant reductions achieved by each regulatory option were calculated using the model facility pollutant reductions and statistically generated weighting factors.

11.2 General Methodology Used to Estimate Untreated Pollutant Loadings

The Agency used analytical data collected during EPA's TECI sampling program to calculate untreated PNPLs for pollutants effectively removed by the regulatory options evaluated for each TECI subcategory (Section 7.0 contains a discussion of pollutants effectively removed). The following table lists the number of wastewater characterization samples collected and analyzed for each TECI subcategory:

Subcategory	Number of Untreated Wastewater Characterization Samples Collected	Number of Facilities Sampled
Truck/Chemical	10	5
Rail/Chemical	5	2
Barge/Chemical & Petroleum	10	3
Truck/Petroleum	5	1
Rail/Petroleum	0	0
Truck/Food	1	1
Rail/Food	1	1
Barge/Food	5	1
Truck/Hopper	0	0
Rail/Hopper	0	0
Barge/Hopper	1	1

Note that although some analytical data were available from facility responses to the Detailed Questionnaire, these data were not useable for one or more of the following reasons: (1) the data provided represented samples collected at a variety of treatment system influent/effluent points that may not correspond to the technology options considered as the bases for regulation; (2) the data provided were an average estimated by the facility over one or more sampling days, rather than individual analytical results as required for statistical analyses; and (3) analytical quality assurance/quality control (QA/QC) data were not provided, prohibiting an assessment of the data quality.

For each facility sampled, data on facility production (i.e., number of tanks cleaned per day), cargo types cleaned, TEC wastewater flow rate, operating hours per day, and operating days per year were collected. These data were used in conjunction with the untreated wastewater analytical data to calculate PNPLs for each subcategory using the methodology described below.

EPA first calculated PNPLs for each untreated wastewater sample collected at each facility using the following equation:

$$L_i = \frac{C_i \times cf \times F}{T} \tag{1}$$

where:

i	=	Pollutant *i* in waste stream
L_i	=	Pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)
C_i	=	Pollutant concentration in TEC wastewater characterization sample (milligram/liter or microgram/liter, depending on the pollutant))
cf	=	Conversion factor, (liters per gallon)
F	=	Daily flow rate (gallons/day); gallons per year calculated by multiplying the flow in gallons per day by the number of operating days per year
T	=	Number of tanks cleaned per day; the number of tanks cleaned per year was calculated by multiplying the number of tanks cleaned per day by the number of operating days per year

Certain pollutants were not detected above the sample detection limits in some wastewater samples. Because both nondetect and detect results represent the variability of pollutant concentrations in TEC wastewater, both results were included in calculating PNPLs. For nondetect results, EPA assumed the pollutant concentration was equal to the sample detection limit for that pollutant. EPA based this assumption on the expectation that the pollutant was present in TEC wastewater, albeit at a concentration less than the sample detection limit.

If duplicate samples or multiple grab samples (e.g., for HEM and SGT-HEM analyses) of untreated wastewater were collected at a facility, EPA calculated the daily average PNPL for each pollutant at that facility using the following equation:

$$DL_i = \frac{\sum_{j=\text{Sample 1}}^{N} L_{i,j}}{N} \qquad (2)$$

where:

DL_i	=	Daily average pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)
i	=	Pollutant *i* in waste stream
$L_{i,j}$	=	Pollutant loading generated per tank cleaned for sample (milligram/tank or microgram/tank, depending on the pollutant)
j	=	Counter for number of duplicate or grab samples collected
N	=	Number of duplicate or grab samples collected

In cases where EPA collected samples from the same sampling point at the same facility over multiple sampling days, EPA calculated a facility average PNPL using the following equation:

$$FL_i = \frac{\sum_{j=\text{Day 1}}^{\text{Day N}} L_{i,j} \text{ (or } DL_{i,j})}{N} \qquad (3)$$

where:

FL_i = Facility-specific average pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)

i = Pollutant *i* in waste stream

$L_{i,j}$ = Pollutant loading generated per tank cleaned on Day j (milligram/tank or microgram/tank, depending on the pollutant)

$DL_{i,j}$ = Daily average pollutant loading generated per tank cleaned on Day j (milligram/tank or microgram/tank, depending on the pollutant)

j = Counter for number of days of sampling at a specific facility

N = Number of sampling days at a specific facility

Finally, EPA calculated average subcategory PNPLs by averaging the applicable average facility-specific PNPLs as shown in the equation below. This methodology ensured that pollutant data from each sampled facility was weighted equally in calculating the subcategory PNPLs, regardless of the number of wastewater samples collected at each facility.

$$PNPL_i = \frac{\sum_{j=\text{Facility 1}}^{\text{Facility N}} FL_{i,j}}{N} \qquad (4)$$

where:

$PNPL_i$ = Subcategory average production normalized pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)

i = Pollutant *i* in waste stream

$FL_{i,j}$ = Facility-specific average pollutant loading generated per tank cleaned (milligram/tank or microgram/tank, depending on the pollutant)

j = Counter for number of facilities sampled for a specific subcategory

N = Number of facilities sampled for a specific subcategory

Additional information on the calculation of untreated PNPLs for each TECI subcategory can be found in reference 1.

11.3 Multiple Subcategory Facility PNPLs

Some modeled facilities have production in more than one subcategory. For example, a facility that cleans both tank trucks and rail tank cars that last transported chemical cargos has production in both the Truck/Chemical and the Rail/Chemical Subcategories. To simplify compliance cost and pollutant reduction estimates, EPA assigned each multiple subcategory facility to a single primary subcategory. As a result of this simplification, EPA modeled control of all TEC wastewater generated by multiple subcategory facilities using the technology options evaluated for the facility's primary subcategory (rather than segregating and treating the waste streams in separate wastewater treatment systems). EPA accounted for untreated TEC wastewater pollutant loadings from other secondary subcategories by using the PNPLs from secondary subcategory wastewater for those pollutants that were also pollutants effectively removed for the primary subcategory. Estimation of pollutant reductions for multiple subcategory facilities is described in greater detail in the rulemaking record.

11.4 TECI Untreated Pollutant Loadings

TECI untreated pollutant loadings represent the industry pollutant loadings before accounting for pollutant removal by treatment technologies already in place at TEC facilities. The Agency estimated untreated pollutant loadings generated by model facilities using the untreated PNPLs developed for each stream type (i.e., PNPLs for tank trucks cleaned at Truck/Chemical Subcategory facilities, etc.) and the number of tanks cleaned per year at each model facility.

The model facility untreated wastewater pollutant loadings were then weighted using statistically-derived weighting factors for each model facility. The weighted model facility loadings were then summed to estimate untreated pollutant loadings for each subcategory and the entire TECI. Tables 11-1 through 11-15 present total industry untreated pollutant loadings by pollutant for each subcategory.

11.5 TECI Baseline Pollutant Loadings

TECI baseline loadings represent the pollutant loadings currently discharged by TEC facilities to U.S. surface waters or to POTWs after accounting for removal of pollutants by existing on-site treatment. Section 10.0 describes the assessment of the treatment in place at each model TEC facility. The model facility baseline pollutant loadings were calculated as the difference between the model facility untreated wastewater pollutant loadings calculated as described in Section 11.4 and the pollutant reductions achieved by treatment in place at each TECI model facility.

The model facility baseline pollutant loadings were then weighted using the statistically-derived weighting factors for each model facility. The weighted model facility baseline loadings were then summed to estimate the baseline pollutant loadings for the entire TECI. Tables 11-1 through 11-15 present the total industry baseline pollutant loadings by pollutant for each subcategory.

11.6 TECI Post-Compliance Pollutant Loadings by Regulatory Option

TECI post-compliance pollutant loadings represent the pollutant loadings that would be discharged following implementation of the regulatory options. Model facility post-compliance pollutant loadings were calculated using the following steps. First, model facility baseline pollutant loadings were calculated as described in Section 11.5. Second, these loadings were converted to baseline pollutant effluent concentrations for each model facility using the baseline pollutant loadings, the facility process wastewater flow, and a conversion factor. Third, the baseline pollutant effluent concentrations were compared to the effluent concentrations achieved by each regulatory option. Finally, the lower of these concentrations was used along with the facility flow and an appropriate conversion factor to determine the model facility post-compliance pollutant loadings for each regulatory option.

The model facility post-compliance pollutant loadings were then weighted using the statistically-derived weighting factors for each model facility. The weighted model facility post-compliance pollutant loadings were then summed to estimate the post-compliance pollutant loadings for the entire TECI. Tables 11-1 through 11-15 present the total industry post-compliance pollutant loadings by pollutant for each subcategory.

11.7 TECI Pollutant Loading Reduction Estimates

The pollutant loading reductions represent the pollutant removal achieved through implementation of the regulatory options. Therefore, the pollutant loading reductions are the difference between the post-compliance pollutant loadings and the baseline pollutant loadings for each regulatory option considered. Estimated pollutant loading reductions achieved by each regulatory option are described below by regulation and are shown in Tables 11-1 through 11-15.

11.7.1 BPT

The following table summarizes pollutant loading reductions for each TECI regulatory option considered for BPT. Note that EPA did not develop or evaluate BPT options for the Truck/Petroleum and Rail/Petroleum Subcategories because the Agency is not aware of any direct discharging facilities in these subcategories. In addition, although EPA developed a BPT option for the Truck/Hopper and Rail/Hopper Subcategories, pollutant reductions for this option were not estimated for these subcategories because none of the model facilities in these subcategories are direct dischargers.

Subcategory	Option	BOD_5 Loading Reduction (pounds/year)	TSS Loading Reduction (pounds/year)	Oil and Grease (HEM) Loading Reduction (pounds/year)	Priority Pollutant Loading Reduction (pounds/year)	Nonconventional Pollutant Loading Reduction (pounds/year) (a)
Truck/Chemical	1	20	75	240,000	5	30
	2	20	75	240,000	5	30
Rail/Chemical	1	1.7	10	540	2.1	110
	2	1.7	2,200	610	4.8	260
	3	1.7	2,400	610	5	350
Barge/Chemical & Petroleum	1	490,000	750,000	5,100,000	27,000	198,000
	2	600,000	860,000	5,100,000	29,000	204,000
Truck/Food, Rail/Food, and Barge/Food	1	0 (b)	0 (b)	0 (b)	0 (b)	0 (b)
	2	0 (b)	0 (b)	0 (b)	0 (b)	0 (b)
Barge/Hopper	1	NC	8,600	NC	1.8	2,500

(a) - The loading reductions presented exclude reduction of COD, TDS, TOC, and TPH.
(b) - Pollutant reductions determined to be zero because all facilities identified by EPA currently meet the proposed regulatory option.
BOD_5 - Biochemical oxygen demand (five-day).
TSS - Total suspended solids.
HEM - Hexane extractable material.
NC - Pollutant loading reductions not calculated because pollutant is not effectively removed by this regulatory option.

Tables 11-1 through 11-4 present the BPT pollutant loading reduction estimates for all pollutants and regulatory options for the following subcategories:

- Truck/Chemical Subcategory (Table 11-1);
- Rail/Chemical Subcategory (Table 11-2);
- Barge/Chemical & Petroleum Subcategory (Table 11-3); and
- Barge/Hopper Subcategory (Table 11-4).

11.7.2 BCT

BCT options developed and evaluated by EPA are identical to those developed and evaluated for BPT. Therefore, BCT pollutant loading reductions are identical to the BPT pollutant loading reductions for conventional pollutants discussed in Section 11.7.1.

11.7.3 BAT

BAT options developed and evaluated by EPA are identical to those developed and evaluated for BPT. Therefore, BAT pollutant loading reductions are identical to the BPT pollutant loading reductions for priority and nonconventional pollutants discussed in Section 11.7.1.

11.7.4 PSES

The following table summarizes pollutant loading reductions for each TECI regulatory option considered for PSES.

Subcategory	Option	Priority Pollutant Loading Reduction (pounds/year)	Nonconventional Pollutant Loading Reduction (pounds/year) (a)
Truck/Chemical	1	56,000	107,000
	2	97,000	620,000
Rail/Chemical	1	370	23,000
	2	390	33,000
	3	1,030	14,000
Barge/Chemical & Petroleum	1	1,200	10,200
	2	3,500	17,000
	3	3,500	17,000
Truck/Food	1	5.5	2,300
	2	470,000	120,000,000
Rail/Food	1	0	0
	2	130,000	33,700,000
Barge/Food	1	0	0
	2	890	222,000
Truck/Petroleum	1	NC	NC
	2	410	7,500
Rail/Petroleum	1	NC	NC
	2	< 1	27
Truck/Hopper	1	1.4	2,200

Subcategory	Option	Priority Pollutant Loading Reduction (pounds/year)	Nonconventional Pollutant Loading Reduction (pounds/year) (a)
Rail/Hopper	1	0	0
Barge/Hopper	1	< 1	250

(a) The loading reductions presented exclude reduction of COD, TDS, TOC, and TPH.
NC - Pollutant loading reductions not calculated because the regulatory options were not fully evaluated by EPA (see Section 9.0).

Tables 11-5 through 11-15 present the PSES pollutant loading reduction estimates for all pollutants and regulatory options for the following subcategories:

- Truck/Chemical Subcategory (Table 11-5);
- Rail/Chemical Subcategory (Table 11-6);
- Barge/Chemical & Petroleum Subcategory (Table 11-7);
- Truck/Food Subcategory (Table 11-8);
- Rail/Food Subcategory (Table 11-9);
- Barge/Food Subcategory (Table 11-10);
- Truck/Petroleum Subcategory (Table 11-11);
- Rail/Petroleum Subcategory (Table 11-12);
- Truck/Hopper Subcategory (Table 11-13);
- Rail/Hopper Subcategory (Table 11-14); and
- Barge/Hopper Subcategory (Table 11-15).

11.8 References[1]

1. Eastern Research Group, Inc. Development of Transportation Equipment Cleaning Industry Production Normalized Pollutant Loadings. Memorandum from Grace Kitzmiller, Eastern Research Group, Inc. to the TECI Rulemaking Record. May 6, 1998 (DCN T09981).

[1] For those references included in the administrative record supporting the proposed TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

Table 11-1

Truck/Chemical Subcategory – Direct Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	420,000	940	920	20	920	20
Oil and Grease (HEM)	NA	250,000	240,000	400	240,000	400	240,000
Total Suspended Solids	NA	220,000	3,500	3,400	75	3,400	75
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	1,000,000	37,000	35,000	1,300	35,000	1,300
Total Organic Carbon	NA	240,000	27,000	27,000	590	27,000	590
Total Petroleum Hydrocarbons (SGT-HEM)	NA	23,000	290	280	6.2	280	6.2
Nonconventional Metals							
Aluminum	7429905	1,100	25	25	< 1	25	< 1
Boron	7440428	580	35	35	< 1	35	< 1
Manganese	7439965	170	27	26	< 1	26	< 1
Tin	7440315	2,100	840	820	18	820	18
Titanium	7440326	34	2.5	2.4	< 1	2.4	< 1
TOTAL Nonconventional Metals		**4,020**	**930**	**910**	**20**	**910**	**20**

Table 11-1 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Nonconventional Organics							
2,4-D	94757	< 1	< 1	< 1	< 1	< 1	< 1
2,4,5-T	93765	< 1	< 1	< 1	< 1	< 1	< 1
2-Methylnaphthalene	91576	13	< 1	< 1	< 1	< 1	< 1
2-Isopropylnaphthalene	2027170	33	1.3	1.3	< 1	1.3	< 1
2,4-DB (Butoxon)	94826	1.3	< 1	< 1	< 1	< 1	< 1
2,4,5-TP	93721	< 1	< 1	< 1	< 1	< 1	< 1
Acetone	67641	5,100	310	300	3.8	300	3.8
alpha-Terpineol	98555	45	1.3	1.3	< 1	1.3	< 1
Azinphos Methyl	86500	< 1	< 1	< 1	< 1	< 1	< 1
Azinphos Ethyl	2642719	< 1	< 1	< 1	< 1	< 1	< 1
Benzoic Acid	65850	4,300	280	270	3.4	270	3.4
Benzyl Alcohol	100516	49	2.5	2.5	< 1	2.5	< 1
Chlorobenzilate	510156	< 1	< 1	< 1	< 1	< 1	< 1
Coumaphos	56724	1.1	< 1	< 1	< 1	< 1	< 1
Dalapon	75990	< 1	< 1	< 1	< 1	< 1	< 1
Diallate	2303164	3.8	< 1	< 1	< 1	< 1	< 1
Dichlofenthion	97176	< 1	< 1	< 1	< 1	< 1	< 1
Dinoseb	88857	< 1	< 1	< 1	< 1	< 1	< 1
Disulfoton	298044	2.6	< 1	< 1	< 1	< 1	< 1
EPN	2104645	< 1	< 1	< 1	< 1	< 1	< 1
gamma-Chlordane	5103742	< 1	< 1	< 1	< 1	< 1	< 1

Table 11-1 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Leptophos	21609905	1	< 1	< 1	< 1	< 1	< 1
m-Xylene	108383	360	1.3	1.3	< 1	1.3	< 1
MCPA	94746	100	47	46	1	46	1
MCPP	7085190	72	9.9	9.7	< 1	9.7	< 1
Merphos	150505	< 1	< 1	< 1	< 1	< 1	< 1
Methyl Ethyl Ketone	78933	920	18	18	< 1	18	< 1
Methyl Isobutyl Ketone	108101	340	21	21	< 1	21	< 1
n-Octadecane	593453	71	< 1	< 1	< 1	< 1	< 1
n-Triacontane	638686	39	1.3	1.3	< 1	1.3	< 1
n-Tetradecane	629594	89	< 1	< 1	< 1	< 1	< 1
n-Decane	124185	63	< 1	< 1	< 1	< 1	< 1
n-Docosane	629970	19	< 1	< 1	< 1	< 1	< 1
n-Dodecane	112403	200	< 1	< 1	< 1	< 1	< 1
n-Eicosane	112958	55	< 1	< 1	< 1	< 1	< 1
n-Hexacosane	630013	26	1.3	1.3	< 1	1.3	< 1
n-Hexadecane	544763	130	< 1	< 1	< 1	< 1	< 1
n-Tetracosane	646311	33	1.3	1.3	< 1	1.3	< 1
Nitrofen	1836755	< 1	< 1	< 1	< 1	< 1	< 1
o-Cresol	95487	13	1.7	1.7	< 1	1.7	< 1
o+p-Xylene	136777612	180	1.3	1.3	< 1	1.3	< 1
p-Cresol	106445	13	1.8	1.7	< 1	1.7	< 1
p-Cymene	99876	10	< 1	< 1	< 1	< 1	< 1

Table 11-1 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Pentachloronitrobenzene	82688	1.4	< 1	< 1	< 1	< 1	< 1
Picloram	1918021	< 1	< 1	< 1	< 1	< 1	< 1
Simazine	122349	46	1	1	< 1	1	< 1
Styrene	100425	570	1.7	1.7	< 1	1.7	< 1
Terbuthylazine	5915413	6.7	< 1	< 1	< 1	< 1	< 1
Tetrachlorvinphos	22248799	< 1	< 1	< 1	< 1	< 1	< 1
TOTAL Nonconventional Organics		**12,900**	**710**	**700**	**10**	**700**	**10**
Other Nonconventionals							
Fluoride	16984488	3,600	2.4	2.3	< 1	2.3	< 1
TOTAL Other Nonconventionals		**3,600**	**2.4**	**2.3**	**< 1**	**2.3**	**< 1**
Other Priority Pollutants							
Total Cyanide	57125	3.4	1.4	1.4	< 1	1.4	< 1
TOTAL Other Priority Pollutants		**3.4**	**1.4**	**1.4**	**< 1**	**1.4**	**< 1**
Priority Metals							
Chromium	7440473	340	2.5	2.5	< 1	2.5	< 1
Copper	7440508	43	11	11	< 1	11	< 1
Mercury	7439976	< 1	< 1	< 1	< 1	< 1	< 1
Zinc	7440666	100	1.5	1.4	< 1	1.4	< 1
TOTAL Priority Metals		**490**	**15**	**15**	**< 1**	**15**	**< 1**
Priority Organics							
1,2-Dichloroethane	107062	98	1.6	1.5	< 1	1.5	< 1

Table 11-1 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
1,1,1-Trichloroethane	71556	130	1.3	1.3	< 1	1.3	< 1
1,2-Dichlorobenzene	95501	18	1.3	1.3	< 1	1.3	< 1
2-Chlorophenol	95578	11	1.7	1.7	< 1	1.7	< 1
4,4'-DDT	50293	< 1	< 1	< 1	< 1	< 1	< 1
Benzene	71432	6.4	< 1	< 1	< 1	< 1	< 1
beta-BHC	319857	< 1	< 1	< 1	< 1	< 1	< 1
Bis (2-ethylhexyl) Phthalate	117817	92	< 1	< 1	< 1	< 1	< 1
Chloroform	67663	12	< 1	< 1	< 1	< 1	< 1
Di-n-Octyl Phthalate	117840	30	1.3	1.3	< 1	1.3	< 1
Dieldrin	60571	< 1	< 1	< 1	< 1	< 1	< 1
Endosulfan II	33213659	< 1	< 1	< 1	< 1	< 1	< 1
Endosulfan Sulfate	1031078	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	100414	81	< 1	< 1	< 1	< 1	< 1
gamma-BHC	58899	< 1	< 1	< 1	< 1	< 1	< 1
Methylene Chloride	75092	2,000	220	210	4.7	210	4.7
Naphthalene	91203	55	< 1	< 1	< 1	< 1	< 1
Tetrachloroethylene	127184	200	1.3	1.3	< 1	1.3	< 1
Toluene	108883	310	1.3	1.3	< 1	1.3	< 1
Trichloroethylene	79016	3.6	1.8	1.7	< 1	1.7	< 1
TOTAL Priority Organics		**3,060**	**230**	**230**	**5**	**230**	**5**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-2

Rail/Chemical Subcategory – Direct Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals									
5-Day Biochemical Oxygen Demand	NA	8,200	410	410	410	410	1.7	1.7	1.7
Oil and Grease (HEM)	NA	3,600	640	96	27	27	540	610	610
Total Suspended Solids	NA	2,400	2,400	2,400	210	36	10	2,200	2,400
Bulk Nonconventionals									
Chemical Oxygen Demand	NA	19,000	2,300	2,300	2,300	2,300	9.4	9.4	9.4
Total Organic Carbon	NA	4,500	830	830	830	830	3.4	3.4	3.4
Total Petroleum Hydrocarbons (SGT-HEM)	NA	860	350	62	15	15	290	340	340
Nonconventional Metals									
Aluminum	7429905	55	55	36	36	< 1	20	20	55
Barium	7440393	3.2	3.2	3.2	< 1	< 1	< 1	2.8	2.8
Titanium	7440326	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TOTAL Nonconventional Metals		**59**	**59**	**39**	**36**	**1**	**20**	**23**	**59**
Nonconventional Organics									
1-Methylphenanthrene	832699	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2,4-D	94757	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2-Methylnaphthalene	91576	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2,4-Diaminotoluene	95807	7.3	7.3	7.3	7.3	< 1	< 1	< 1	7.0
2,4,5-TP	93721	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 11-2 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
2,4,5-T	93765	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2,4-DB (Butoxon)	94826	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Acephate	30560191	3.0	3.0	3.0	3.0	< 1	< 1	< 1	2.7
Acetone	67641	2.1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Alachlor	15972608	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Atrazine	1912249	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Benefluralin	1861401	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Benzoic Acid	65850	7.7	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Biphenyl	92524	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Butachlor	23184669	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Captafol	2425061	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbazole	86748	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Carbophenothion	786196	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlordane	57749	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzilate	510156	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroneb	2675776	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dacthal (DCPA)	1861321	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dalapon	75990	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Diallate	2303164	1.3	1.3	< 1	< 1	< 1	< 1	1.1	1.1
Dicamba	1918009	2.0	2.0	1.9	< 1	< 1	< 1	2.0	2.0
Dichloroprop	120365	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dicofol	115322	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dinoseb	88857	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dioxathion	78342	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 11-2 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Endrin Ketone	53494705	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Ethalfluralin	55283686	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
gamma-Chlordane	5103742	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Isodrin	465736	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Isopropalin	33820530	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
m-Xylene	108383	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
MCPP	7085190	130	130	130	9.8	< 1	< 1	120	130
Methyl Ethyl Ketone	78933	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Metribuzin	21087649	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Mirex	2385855	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Triacontane	638686	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Tetracosane	646311	1.0	1.0	< 1	< 1	< 1	< 1	< 1	< 1
n-Tetradecane	629594	6.5	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Octadecane	593453	5.7	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Docosane	629970	1.2	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Octacosane	630024	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Dodecane	112403	1.7	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Eicosane	112958	4.9	1.1	< 1	< 1	< 1	1.0	1.1	1.1
n-Hexadecane	544763	9.4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Hexacosane	630013	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Nitrofen	1836755	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
o+p-Xylene	136777612	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
p-Cresol	106445	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pendamethalin	40487421	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 11-2 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Pentachloronitrobenzene	82688	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Perthane	72560	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Propachlor	1918167	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Propazine	139402	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Simazine	122349	110	110	27	16	< 1	83	94	110
Strobane	8001501	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Styrene	100425	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Terbacil	5902512	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Terbuthylazine	5915413	9.4	9.4	9.3	9.3	< 1	< 1	< 1	9.4
Tetrachlorvinphos	22248799	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Tokuthion	34643464	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Triadimefon	43121433	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichlorfon	52686	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloronate	327980	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trifluralin	1582098	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trimethylphosphate	512561	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TOTAL Nonconventional Organics		**320**	**280**	**190**	**50**	**4**	**92**	**230**	**280**
Other Nonconventionals									
Fluoride	16984488	10	10	10	2.8	2.8	< 1	7.6	7.6
TOTAL Other Nonconventionals		**10**	**10**	**10**	**2.8**	**2.8**	**< 1**	**7.6**	**7.6**
Priority Metals									
Chromium	7440473	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Copper	7440508	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 11-2 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Zinc	7440666	2.1	2.1	2.1	< 1	< 1	< 1	2.1	2.1
TOTAL Priority Metals		**3**	**3**	**3**	**< 1**	**< 1**	**< 1**	**3**	**3**
Priority Organics									
4,4'-DDD	72548	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
4,4'-DDT	50293	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
alpha-BHC	319846	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Anthracene	120127	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
beta-BHC	319857	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
delta-BHC	319868	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dieldrin	60571	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Endosulfan I	959988	< 1	< 1	< 1	< 1	< 1	0	< 1	< 1
Endosulfan Sulfate	1031078	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Endrin Aldehyde	7421934	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	100414	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Fluoranthene	206440	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
gamma-BHC	58899	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Naphthalene	91203	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Phenanthrene	85018	1.1	1.1	< 1	< 1	< 1	< 1	< 1	< 1
Phenol	108952	1.8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pyrene	129000	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TOTAL Priority Organics		**5**	**3**	**1**	**1**	**1**	**2**	**2**	**2**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-3

Barge/Chemical & Petroleum Subcategory – Direct Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	2,600,000	610,000	120,000	6,700	490,000	600,000
Oil and Grease (HEM)	NA	5,200,000	5,100,000	3,900	2,000	5,100,000	5,100,000
Total Suspended Solids	NA	880,000	860,000	110,000	2,200	750,000	860,000
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	16,000,000	9,900,000	250,000	11,000	9,700,000	9,900,000
Total Dissolved Solids	NA	1,400,000	1,400,000	1,400,000	410,000	2,800	980,000
Total Organic Carbon	NA	4,000,000	980,000	240,000	1,800	740,000	980,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	260,000	250,000	2,700	2,700	250,000	250,000
Nonconventional Metals							
Aluminum	7429905	4,700	4,600	740	15	3,800	4,600
Hexavalent Chromium	18540299	69	22	8	8	14	14
Iron	7439896	93,000	91,000	2,500	43	88,000	91,000
Manganese	7439965	750	740	290	7	440	730
Molybdenum	7439987	140	130	130	2	< 1	130
Tantalum	7440257	140	140	84	84	52	52
Titanium	7440326	8	8	1	1	7	7

Table 11-3 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Zirconium	7440677	10	10	9	9	< 1	< 1
TOTAL Nonconventional Metals		**98,000**	**96,000**	**3,800**	**170**	**93,000**	**96,000**
Nonconventional Organics							
1-Methylfluorene	1730376	190	190	7	7	180	180
1-Methylphenanthrene	832699	430	430	8	8	420	420
2,3-Benzofluorene	243174	45	44	5	5	39	39
2-Methylnaphthalene	91576	1,600	1,400	41	5	1,400	1,400
3,6-Dimethylphenanthrene	1576676	93	92	7	7	85	85
Acetone	67641	29,000	7,700	2,300	100	5,400	7,600
Benzoic Acid	65850	470	110	25	25	82	82
Biphenyl	92524	550	520	9	9	510	510
Dalapon	75990	7	2	< 1	< 1	2	2
m-Xylene	108383	1,500	510	210	23	300	490
Methyl Ethyl Ketone	78933	35,000	6,000	190	46	5,800	5,900
Methyl Isobutyl Ketone	108101	14,000	2,300	45	45	2,300	2,300
n-Dodecane	112403	7,200	6,900	44	4	6,900	6,900
n-Docosane	629970	680	650	8	8	640	640
n-Decane	124185	13,000	13,000	16	4	13,000	13,000
n-Octacosane	630024	37	36	4	4	32	32
n-Octadecane	593453	4,000	3,900	20	20	3,800	3,800
n-Hexacosane	630013	79	77	4	4	73	73
n-Hexadecane	544763	8,000	7,500	15	4	7,500	7,500
n-Tetracosane	646311	400	390	6	6	390	390
n-Tetradecane	629594	15,000	13,000	19	4	13,000	13,000

Table 11-3 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
n-Eicosane	112958	2,100	2,000	17	17	2,000	2,000
o+p-Xylene	136777612	950	540	290	35	260	510
p-Cymene	99876	770	130	5	5	130	130
Pentamethylbenzene	700129	630	620	6	6	610	610
Styrene	100425	42,000	34,000	130	5	34,000	34,000
TOTAL Nonconventional Organics		**180,000**	**102,000**	**3,400**	**410**	**99,000**	**102,000**
Other Nonconventionals							
Ammonia as Nitrogen	7664417	39,000	6,300	1	< 1	6,300	6,300
Fluoride	16984488	1,100	1,000	1,000	1,000	2	2
TOTAL Other Nonconventionals		**40,000**	**7,300**	**1,040**	**1,040**	**6,300**	**6,300**
Priority Metals							
Beryllium	7440417	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	7440439	13	13	1	1	12	12
Chromium	7440473	71	69	10	10	60	60
Copper	7440508	340	330	18	18	310	310
Lead	7439921	120	120	16	16	110	110
Mercury	7439976	1	1	< 1	< 1	< 1	< 1
Nickel	7440020	390	390	130	4	260	380
Zinc	7440666	5,200	5,100	1,300	36	3,900	5,100
TOTAL Priority Metals		**6,200**	**6,040**	**1,400**	**85**	**4,600**	**6,000**
Priority Organics							
Acenaphthene	83329	140	140	6	6	140	140
Acenaphthylene	208968	120	120	9	9	110	110
Acrylonitrile	107131	31,000	5,100	140	140	5,000	5,000

Table 11-3 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Anthracene	120127	97	95	4	4	91	91
Benzene	71432	3,500	660	100	4	560	660
Bis (2-ethylhexyl) Phthalate	117817	210	190	4	4	190	190
Chloroform	67663	37	15	4	4	11	11
Di-n-Octyl Phthalate	117840	130	130	6	6	120	120
Ethylbenzene	100414	2,100	530	150	10	380	520
Fluorene	86737	220	220	8	8	210	210
Methylene Chloride	75092	14	12	7	7	5	5
Naphthalene	91203	16,000	14,000	65	11	14,000	14,000
Phenanthrene	85018	330	330	9	9	320	320
Phenol	108952	180	39	4	4	34	34
Pyrene	129000	180	180	4	4	170	170
Toluene	108883	4,900	1,000	170	16	830	990
TOTAL Priority Organics		**59,000**	**23,000**	**700**	**250**	**22,000**	**23,000**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-4

Barge/Hopper Subcategory – Direct Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
Total Suspended Solids	NA	28,000	19,000	10,000	8,600
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	44,000	8,700	6,000	2,700
Nonconventional Metals					
Aluminum	7429905	300	210	95	110
Calcium	7440702	5,400	3,800	2,100	1,700
Iron	7439896	1,800	1,200	500	670
Manganese	7439965	55	38	18	20
Titanium	7440326	8.6	6.0	1.8	4.2
TOTAL Nonconventional Metals		**7,600**	**5,200**	**2,700**	**2,500**
Priority Metals					
Beryllium	7440417	< 1	< 1	< 1	< 1
Chromium	7440473	2.5	1.7	1.5	< 1
Zinc	7440666	15	3.4	1.8	1.6
TOTAL Priority Metals		**18**	**5.2**	**3.4**	**1.8**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-5

Truck/Chemical Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	18,000,000	9,400,000	620,000	620,000	8,800,000	8,800,000
Oil and Grease (HEM)	NA	11,000,000	9,700,000	77,000	24,000	9,600,000	9,600,000
Total Suspended Solids	NA	9,800,000	5,000,000	300,000	110,000	4,700,000	4,900,000
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	45,000,000	22,000,000	10,000	10,000	22,000,000	22,000,000
Total Organic Carbon	NA	11,000,000	10,000,000	9,500,000	910,000	560,000	9,100,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	1,000,000	510,000	23,000	23,000	490,000	490,000
Nonconventional Metals							
Aluminum	7429905	48,000	27,000	6,000	840	21,000	27,000
Boron	7440428	25,000	24,000	23,000	1,200	1,300	23,000
Manganese	7439965	4,000	1,600	900	900	690	690
Tin	7440315	92,000	88,000	83,000	28,000	4,900	60,000
Titanium	7440326	1,500	770	82	82	690	690
TOTAL Nonconventional Metals		**171,000**	**140,000**	**110,000**	**31,000**	**29,000**	**111,000**
Nonconventional Organics							
2,4-D	94757	22	19	17	17	1.7	1.7
2,4,5-T	93765	6.8	5.5	4.4	4.4	1.1	1.1
2-Methylnaphthalene	91576	550	300	43	43	260	260
2-Isopropylnaphthalene	2027170	1,400	730	43	43	690	690
2,4-DB (Butoxon)	94826	50	43	39	8.6	4.5	35

Table 11-5 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
2,4,5-TP	93721	4.8	3.5	2.2	2.2	1.4	1.4
Acetone	67641	220,000	210,000	200,000	42,000	12,000	170,000
alpha-Terpineol	98555	1,900	1,800	1,600	43	190	1,700
Azinphos Methyl	86500	32	27	22	22	5.8	5.8
Azinphos Ethyl	2642719	23	17	8.6	8.6	8.1	8.1
Benzoic Acid	65850	180,000	180,000	170,000	81,000	9,800	96,000
Benzyl Alcohol	100516	2,100	1,100	84	84	1,000	1,000
Chlorobenzilate	510156	33	19	4.7	4.3	14	15
Coumaphos	56724	47	37	22	22	15	15
Dalapon	75990	7.1	6.8	6.4	2.6	< 1	4.2
Diallate	2303164	150	110	57	20	50	87
Dichlofenthion	97176	20	15	8.6	8.6	6.8	6.8
Dinoseb	88857	16	15	14	14	1	1
Disulfoton	298044	120	110	100	15	6.8	95
EPN	2104645	35	23	8.6	8.6	14	14
gamma-Chlordane	5103742	1.6	< 1	< 1	< 1	< 1	< 1
Leptophos	21609905	45	28	8.6	8.6	19	19
m-Xylene	108383	15,000	8,200	910	43	7,300	8,200
MCPA	94746	4,500	3,500	2,200	1,600	1,300	2,000
MCPP	7085190	1,800	990	920	330	71	670
Merphos	150505	17	16	15	8.6	< 1	7.6
Methyl Ethyl Ketone	78933	40,000	38,000	36,000	8,900	2,100	29,000
Methyl Isobutyl Ketone	108101	15,000	12,000	7,000	1,300	4,700	10,000
n-Octadecane	593453	3,000	1,500	43	43	1,500	1,500

Table 11-5 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
n-Triacontane	638686	1,700	860	43	43	810	810
n-Tetradecane	629594	3,800	1,900	43	43	1,800	1,800
n-Decane	124185	2,700	1,400	43	43	1,300	1,300
n-Docosane	629970	830	440	43	43	390	390
n-Dodecane	112403	8,800	4,400	43	43	4,300	4,300
n-Eicosane	112958	2,300	1,200	120	120	1,100	1,100
n-Hexacosane	630013	1,100	580	43	43	540	540
n-Hexadecane	544763	5,600	2,700	43	43	2,700	2,700
n-Tetracosane	646311	1,400	720	43	43	680	680
Nitrofen	1836755	5.8	3.4	< 1	< 1	2.5	2.5
o-Cresol	95487	570	320	58	58	260	260
o+p-Xylene	136777612	8,000	4,300	580	43	3,700	4,300
p-Cresol	106445	550	530	500	58	29	470
p-Cymene	99876	450	270	76	76	190	190
Pentachloronitrobenzene	82688	60	30	< 1	< 1	30	30
Picloram	1918021	9.2	5.9	2.2	2.2	3.8	3.8
Simazine	122349	880	150	35	35	110	110
Styrene	100425	25,000	15,000	3,800	120	11,000	15,000
Terbuthylazine	5915413	190	83	22	22	61	61
Tetrachlorvinphos	22248799	18	14	8.6	8.6	5.2	5.2
TOTAL Nonconventional Organics		**560,000**	**490,000**	**420,000**	**140,000**	**70,000**	**360,000**
Other Nonconventionals							
Fluoride	16984488	160,000	150,000	140,000	79	8,300	150,000
TOTAL Other Nonconventionals		**160,000**	**150,000**	**140,000**	**79**	**8,300**	**150,000**

Table 11-5 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Other Priority Pollutants							
Total Cyanide	57125	150	140	130	46	7.7	93
TOTAL Other Priority Pollutants		**150**	**140**	**130**	**46**	**7.7**	**93**
Priority Metals							
Chromium	7440473	15,000	7,500	84	84	7,400	7,400
Copper	7440508	1,900	1,200	370	370	790	790
Mercury	7439976	12	6.6	1	< 1	5.6	5.7
Zinc	7440666	4,500	2,300	49	49	2,200	2,200
TOTAL Priority Metals		**21,000**	**11,000**	**510**	**510**	**10,400**	**10,400**
Priority Organics							
1,2-Dichloroethane	107062	4,200	2,400	490	53	1,900	2,400
1,1,1-Trichloroethane	71556	5,500	3,000	400	43	2,600	2,900
1,2-Dichlorobenzene	95501	770	410	43	43	370	370
2-Chlorophenol	95578	470	270	57	57	210	210
4,4'-DDT	50293	2.8	1.6	< 1	< 1	1.2	1.2
Benzene	71432	280	190	84	84	110	110
beta-BHC	319857	3.9	1.9	< 1	< 1	1.4	1.4
Bis (2-ethylhexyl) Phthalate	117817	4,000	2,000	66	66	2,000	2,000
Chloroform	67663	520	380	190	190	190	190
Di-n-Octyl Phthalate	117840	1,300	680	43	43	640	640
Dieldrin	60571	1.2	< 1	< 1	< 1	< 1	< 1
Endosulfan II	33213659	27	16	4.3	4.3	12	12
Endosulfan Sulfate	1031078	2.8	1.6	< 1	< 1	1.2	1.2
Ethylbenzene	100414	3,500	2,100	550	43	1,500	2,000

Table 11-5 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
gamma-BHC	58899	1.8	1.7	1.6	< 1	< 1	1.2
Methylene Chloride	75092	87,000	70,000	45,000	7,300	25,000	62,000
Naphthalene	91203	2,400	1,200	84	84	1,100	1,100
Tetrachloroethylene	127184	8,700	4,600	400	43	4,200	4,500
Toluene	108883	13,000	8,000	2,100	43	5,900	8,000
Trichloroethylene	79016	160	110	59	59	56	56
TOTAL Priority Organics		**133,000**	**95,000**	**49,000**	**8,200**	**46,000**	**87,000**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-6

Rail/Chemical Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals									
Oil and Grease (HEM)	NA	660,000	510,000	36,000	21,000	21,000	480,000	490,000	490,000
Total Suspended Solids	NA	420,000	220,000	190,000	27,000	4,800	32,000	200,000	220,000
Bulk Nonconventionals									
Total Petroleum Hydrocarbons (SGT-HEM)	NA	150,000	110,000	9,400	5,000	5,000	100,000	110,000	110,000
Nonconventional Metals									
Aluminum	7429905	9,300	8,400	4,700	4,700	15	3,700	3,700	8,400
Barium	7440393	570	320	270	56	56	52	270	270
Titanium	7440326	84	39	35	1.5	1.5	3.8	38	38
TOTAL Nonconventional Metals		**10,000**	**8,700**	**5,020**	**4,800**	**72**	**3,700**	**4,000**	**8,700**
Nonconventional Organics									
1-Methylphenanthrene	832699	69	61	5.7	5.7	5.7	55	55	55
2,4-D	94757	45	27	4.8	1.6	1.6	22	26	26
2,4-Diaminotoluene	95807	1,300	1,300	1,200	1,200	48	8.7	8.7	1,200
2,4,5-TP	93721	7.7	3.8	3.4	< 1	< 1	< 1	3.5	3.5
2,4,5-T	93765	7.7	4.8	1.3	< 1	< 1	3.5	4.2	4.5
2,4-DB (Butoxon)	94826	77	50	40	12	3.1	9.5	38	47
Acephate	30560191	520	480	450	440	37	32	39	440
Alachlor	15972608	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 11-6 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Atrazine	1912249	66	66	65	55	30	< 1	11	35
Benefluralin	1861401	1.5	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Benzoic Acid	65850	1,900	1,900	1,900	1,900	43	14	14	1,900
Butachlor	23184669	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Captafol	2425061	1.3	1.2	< 1	< 1	< 1	< 1	< 1	< 1
Carbazole	86748	77	68	26	26	26	42	42	42
Carbophenothion	786196	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzilate	510156	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chloroneb	2675776	15	15	15	13	< 1	< 1	2.4	15
Dacthal (DCPA)	1861321	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dalapon	75990	10	9.3	2.5	2.5	2.5	6.8	6.8	6.8
Diallate	2303164	220	160	36	24	24	120	130	130
Dicamba	1918009	340	150	140	< 1	< 1	10	150	150
Dichloroprop	120365	43	32	8.7	6.5	1.7	23	25	30
Dicofol	115322	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dinoseb	88857	19	11	2.5	< 1	< 1	8.6	10	10
Dioxathion	78342	5.1	4.6	2.4	2.4	2.4	2.1	2.1	2.1
Endrin Ketone	53494705	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethalfluralin	55283686	2.9	2.9	2.6	1.9	< 1	< 1	1	2.9
gamma-Chlordane	5103742	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Isodrin	465736	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Isopropalin	33820530	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
m-Xylene	108383	160	160	150	150	4.8	1.1	1.1	150

Table 11-6 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
MCPP	7085190	22,000	12,000	10,000	1,300	79	1,400	10,000	11,000
Methyl Ethyl Ketone	78933	250	250	250	250	35	1.9	1.9	220
Metribuzin	21087649	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Mirex	2385855	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
n-Hexacosane	630013	110	96	8	8	8	88	88	88
n-Triacontane	638686	71	63	10	10	10	53	53	53
n-Docosane	629970	210	180	13	13	13	170	170	170
n-Hexadecane	544763	1,600	1,400	19	19	19	1,400	1,400	1,400
n-Octadecane	593453	990	840	12	4.8	4.8	830	830	830
n-Tetradecane	629594	1,100	960	12	4.8	4.8	950	950	950
n-Dodecane	112403	320	230	18	4.8	4.8	210	220	220
n-Tetracosane	646311	180	160	15	15	15	140	140	140
n-Eicosane	112958	850	700	13	4.8	4.8	690	700	700
n-Octacosane	630024	66	58	8.5	8.5	8.5	50	50	50
Nitrofen	1836755	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
o+p-Xylene	136777612	100	100	100	100	4.8	< 1	< 1	98
p-Cresol	106445	34	34	34	34	4.8	< 1	< 1	29
Pendamethalin	40487421	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Pentachloronitrobenzene	82688	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Perthane	72560	31	27	3.8	3.8	3.6	23	23	23
Propachlor	1918167	9.9	8.7	< 1	< 1	< 1	8.1	8.1	8.1
Propazine	139402	10	9.3	2.4	2.4	2.4	6.9	6.9	6.9
Simazine	122349	19,000	15,000	2,500	2,100	5.3	12,000	13,000	15,000

Table 11-6 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Strobane	8001501	36	32	1.9	1.9	1.9	30	30	30
Styrene	100425	110	110	5.4	5.4	5.4	100	100	100
Terbacil	5902512	15	13	< 1	< 1	< 1	12	12	12
Terbuthylazine	5915413	1,600	1,600	1,600	1,300	1.9	11	260	1,600
Tetrachlorvinphos	22248799	1.6	1.4	< 1	< 1	< 1	< 1	< 1	< 1
Tokuthion	34643464	2.2	1.9	< 1	< 1	< 1	< 1	< 1	< 1
Triadimefon	43121433	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichlorfon	52686	5.3	4.7	2.4	2.4	2.4	2.3	2.3	2.3
Trichloronate	327980	1.5	1.3	< 1	< 1	< 1	< 1	< 1	< 1
Trifluralin	1582098	1.1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trimethylphosphate	512561	2.4	2.1	< 1	< 1	< 1	1.1	1.1	1.1
TOTAL Nonconventional Organics		**55,000**	**39,000**	**20,000**	**9,300**	**560**	**19,000**	**29,000**	**38,000**
Other Nonconventionals									
Fluoride	16984488	1,900	1,900	1,900	1,900	360	14	14	1,500
TOTAL Other Nonconventionals		**1,900**	**1,900**	**1,900**	**1,900**	**360**	**14**	**14**	**1,500**
Priority Metals									
Chromium	7440473	86	54	43	4.8	4.8	11	49	49
Copper	7440508	83	43	37	3.9	3.9	5.4	39	39
Zinc	7440666	370	180	160	7.3	7.3	17	170	170
TOTAL Priority Metals		**540**	**270**	**240**	**16**	**16**	**33**	**260**	**260**

Table 11-6 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)	Option 3 Pollutant Reduction from Baseline (lb/yr)
Priority Organics									
4,4'-DDD	72548	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
4,4'-DDT	50293	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
alpha-BHC	319846	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Anthracene	120127	91	80	25	25	25	55	55	55
beta-BHC	319857	20	18	< 1	< 1	< 1	18	18	18
Chlordane and/or alpha-Chlordane	57749/ 5103719	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
delta-BHC	319868	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dieldrin	60571	1.3	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Endosulfan I	959988	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Endosulfan Sulfate	1031078	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Endrin Aldehyde	7421934	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	100414	71	71	70	70	4.8	< 1	< 1	66
Fluoranthene	206440	84	74	8.4	8.4	8.4	65	65	65
gamma-BHC	58899	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Naphthalene	91203	62	43	34	12	12	9.1	32	32
Phenanthrene	85018	180	160	22	22	22	140	140	140
Phenol	108952	350	350	340	340	4.8	2.4	2.4	340
Pyrene	129000	66	58	7.7	7.7	7.7	50	50	50
TOTAL Priority Organics		**930**	**860**	**510**	**490**	**85**	**340**	**370**	**770**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-7

Barge/Chemical & Petroleum Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction From Baseline (lb/yr)	Option 2 Pollutant Reduction From Baseline (lb/yr)	Option 3 Pollutant Reduction From Baseline (lb/yr)
Bulk Conventionals									
5-Day Biochemical Oxygen Demand	NA	140,000	130,000	130,000	6,000	340	1,200	130,000	130,000
Oil and Grease (HEM)	NA	290,000	290,000	810	200	100	290,000	290,000	290,000
Total Suspended Solids	NA	47,000	47,000	1,200	1,200	110	46,000	46,000	47,000
Bulk Nonconventionals									
Chemical Oxygen Demand	NA	870,000	860,000	250,000	13,000	550	610,000	850,000	860,000
Total Dissolved Solids	NA	81,000	80,000	79,000	79,000	22,000	710	710	57,000
Total Organic Carbon	NA	220,000	210,000	210,000	12,000	89	1,900	200,000	210,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	14,000	14,000	110	110	110	14,000	14,000	14,000
Nonconventional Metals									
Aluminum	7429905	260	260	18	18	< 1	240	240	260
Hexavalent Chromium	18540299	4	3.9	3.9	< 1	< 1	< 1	3.5	3.5
Iron	7439896	5,200	5,100	140	140	2.2	5,000	5,000	5,100
Manganese	7439965	38	38	9.7	9.7	< 1	28	28	37
Molybdenum	7439987	7.6	7.5	7.5	7.5	< 1	< 1	< 1	7.4
Tantalum	7440257	7.8	7.8	4.3	4.3	4.3	3.5	3.5	3.5
Titanium	7440326	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Zirconium	7440677	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TOTAL Nonconventional Metals		**5,500**	**5,400**	**190**	**180**	**8.7**	**5,200**	**5,200**	**5,400**

Table 11-7 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction From Baseline (lb/yr)	Option 2 Pollutant Reduction From Baseline (lb/yr)	Option 3 Pollutant Reduction From Baseline (lb/yr)
Nonconventional Organics									
1-Methylfluorene	1730376	11	11	< 1	< 1	< 1	11	11	11
1-Methylphenanthrene	832699	24	24	< 1	< 1	< 1	23	23	23
2,3-Benzofluorene	243174	2.5	2.5	< 1	< 1	< 1	2.3	2.3	2.3
2-Methylnaphthalene	91576	90	89	9.4	2	< 1	80	87	89
3,6-Dimethylphenanthrene	1576676	5.3	5.2	< 1	< 1	< 1	5	5	5
Acetone	67641	1,600	1,600	1,600	120	5.2	14	1,500	1,600
Benzoic Acid	65850	32	32	32	1.3	1.3	< 1	31	31
Biphenyl	92524	31	30	1.2	< 1	< 1	29	30	30
Dalapon	75990	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
m-Xylene	108383	83	82	81	11	1.2	< 1	71	81
Methyl Ethyl Ketone	78933	2,000	2,000	1,900	9.3	2.3	17	2,000	2,000
Methyl Isobutyl Ketone	108101	790	780	770	2.3	2.3	6.9	780	780
n-Dodecane	112403	410	400	10	2.2	< 1	390	400	400
n-Docosane	629970	38	38	< 1	< 1	< 1	37	37	37
n-Decane	124185	740	730	5.7	< 1	< 1	730	730	730
n-Octacosane	630024	2.1	2.1	< 1	< 1	< 1	1.9	1.9	1.9
n-Octadecane	593453	230	220	4.4	< 1	< 1	220	220	220
n-Hexacosane	630013	4.5	4.4	< 1	< 1	< 1	4.1	4.1	4.1
n-Hexadecane	544763	450	450	15	< 1	< 1	430	450	450
n-Tetracosane	646311	23	22	< 1	< 1	< 1	22	22	22
n-Tetradecane	629594	820	810	47	< 1	< 1	770	810	810
n-Eicosane	112958	120	120	2.9	< 1	< 1	110	120	120

Table 11-7 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction From Baseline (lb/yr)	Option 2 Pollutant Reduction From Baseline (lb/yr)	Option 3 Pollutant Reduction From Baseline (lb/yr)
o+p-Xylene	136777612	54	53	53	16	1.7	< 1	37	51
p-Cymene	99876	43	43	< 1	< 1	< 1	43	43	43
Pentamethylbenzene	700129	35	35	< 1	< 1	< 1	35	35	35
Styrene	100425	2,400	2,300	290	6.5	< 1	2,000	2,300	2,300
TOTAL Nonconventional Organics		**10,000**	**9,900**	**4,900**	**180**	**21**	**5,010**	**9,700**	**9,900**
Other Nonconventionals									
Ammonia as Nitrogen	7664417	2,200	2,200	2,200	< 1	< 1	19	2,200	2,200
Fluoride	16984488	65	64	64	64	64	< 1	< 1	< 1
TOTAL Other Nonconventionals		**2,300**	**2,200**	**2,200**	**64**	**64**	**20**	**2,200**	**2,200**
Priority Metals									
Beryllium	7440417	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Cadmium	7440439	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Chromium	7440473	3.8	3.7	< 1	< 1	< 1	3.6	3.6	3.6
Copper	7440508	12	12	5.3	5.3	5.3	6.3	6.3	6.3
Lead	7439921	5.7	5.6	< 1	< 1	< 1	4.8	4.8	4.8
Mercury	7439976	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Nickel	7440020	19	19	6.1	6.1	< 1	13	13	19
Zinc	7440666	280	280	27	27	1.8	250	250	280
TOTAL Priority Metals		**320**	**320**	**39**	**39**	**8.3**	**280**	**280**	**310**

Table 11-7 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 3 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction From Baseline (lb/yr)	Option 2 Pollutant Reduction From Baseline (lb/yr)	Option 3 Pollutant Reduction From Baseline (lb/yr)
Priority Organics									
Acenaphthene	83329	6.6	6.5	< 1	< 1	< 1	6.1	6.1	6.1
Acenaphthylene	208968	5.5	5.4	< 1	< 1	< 1	4.9	4.9	4.9
Acrylonitrile	107131	1,700	1,700	1,700	7.1	7.1	15	1,700	1,700
Anthracene	120127	4	3.9	< 1	< 1	< 1	3.6	3.6	3.6
Benzene	71432	180	180	180	5	< 1	1.6	170	180
Bis (2-ethylhexyl) Phthalate	117817	12	12	< 1	< 1	< 1	11	12	12
Chloroform	67663	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Di-n-Octyl Phthalate	117840	7.4	7.3	< 1	< 1	< 1	6.5	6.5	6.5
Ethylbenzene	100414	120	120	120	7.9	< 1	1	110	120
Fluorene	86737	11	11	< 1	< 1	< 1	10	10	10
Methylene Chloride	75092	3.7	3.6	3.6	< 1	< 1	< 1	3.2	3.2
Naphthalene	91203	900	890	76	3.2	< 1	820	890	890
Phenanthrene	85018	17	17	< 1	< 1	< 1	16	16	16
Phenol	108952	10	10	10	< 1	< 1	< 1	9.8	9.8
Pyrene	129000	8.7	8.6	< 1	< 1	< 1	8.3	8.3	8.3
Toluene	108883	270	270	270	8.7	< 1	2.4	260	270
TOTAL Priority Organics		**3,300**	**3,200**	**2,300**	**37**	**14**	**904**	**3,200**	**3,200**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-8

Truck/Food Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	17,000,000,000	17,000,000,000	17,000,000,000	25,000	3,000,000	17,000,000,000
Oil and Grease (HEM)	NA	1,700,000,000	68,000,000	310,000	9,500	68,000,000	68,000,000
Total Suspended Solids	NA	3,800,000,000	3,800,000,000	3,800,000,000	70,000	670,000	3,800,000,000
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	85,000,000,000	84,000,000,000	84,000,000,000	83,000	15,000,000	84,000,000,000
Total Dissolved Solids	NA	61,000,000,000	61,000,000,000	61,000,000,000	640,000	11,000,000	61,000,000,000
Total Organic Carbon	NA	32,000,000,000	32,000,000,000	32,000,000,000	97,000	5,600,000	32,000,000,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	110,000,000	110,000,000	110,000,000	9,500	19,000	110,000,000
Nonconventional Organics							
Benzoic Acid	65850	4,600,000	4,600,000	4,600,000	95	52	4,600,000
Hexanoic Acid	142621	110,000,000	110,000,000	110,000,000	44	1,200	110,000,000
TOTAL Nonconventional Organics		**110,000,000**	**110,000,000**	**110,000,000**	**140**	**1,200**	**110,000,000**
Other Nonconventionals							
Ammonia as Nitrogen	7664417	6,100,000	6,100,000	6,100,000	500	1,100	6,100,000
TOTAL Other Nonconventionals		**6,100,000**	**6,100,000**	**6,100,000**	**500**	**1,100**	**6,100,000**

Table 11-8 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Priority Organics							
Phenol	108952	470,000	470,000	470,000	19	5.5	470,000
TOTAL Priority Organics		**470,000**	**470,000**	**470,000**	**19**	**5.5**	**470,000**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-9

Rail/Food Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	4,900,000,000	4,900,000,000	4,900,000,000	3,800	< 1	4,900,000,000
Oil and Grease (HEM)	NA	490,000,000	59,000	50,000	1,500	9,800	58,000
Total Suspended Solids	NA	1,100,000,000	1,100,000,000	1,100,000,000	11,000	0	1,100,000,000
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	24,000,000,000	24,000,000,000	24,000,000,000	13,000	< 1	24,000,000,000
Total Dissolved Solids	NA	17,000,000,000	17,000,000,000	17,000,000,000	97,000	0	17,000,000,000
Total Organic Carbon	NA	9,200,000,000	9,200,000,000	9,200,000,000	15,000	0	9,200,000,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	31,000,000	31,000,000	31,000,000	1,500	0	31,000,000
Nonconventional Organics							
Benzoic Acid	65850	1,300,000	1,300,000	1,300,000	15	0	1,300,000
Hexanoic Acid	142621	31,000,000	31,000,000	31,000,000	6.8	0	31,000,000
TOTAL Nonconventional Organics		**32,000,000**	**32,000,000**	**32,000,000**	**21**	**0**	**32,000,000**
Other Nonconventionals							
Ammonia as Nitrogen	7664417	1,700,000	1,700,000	1,700,000	77	0	1,700,000
TOTAL Other Nonconventionals		**1,700,000**	**1,700,000**	**1,700,000**	**77**	**0**	**1,700,000**

Table 11-9 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Priority Organics							
Phenol	108952	130,000	130,000	130,000	2.9	0	130,000
TOTAL Priority Organics		**130,000**	**130,000**	**130,000**	**2.9**	**0**	**130,000**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-10

Barge/Food Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals							
5-Day Biochemical Oxygen Demand	NA	33,000,000	33,000,000	33,000,000	20	0	33,000,000
Oil and Grease (HEM)	NA	3,300,000	270	270	7.9	0	260
Total Suspended Solids	NA	7,200,000	7,200,000	7,200,000	58	0	7,200,000
Bulk Nonconventionals							
Chemical Oxygen Demand	NA	160,000,000	160,000,000	160,000,000	68	0	160,000,000
Total Dissolved Solids	NA	120,000,000	120,000,000	120,000,000	530	0	120,000,000
Total Organic Carbon	NA	61,000,000	61,000,000	61,000,000	80	0	61,000,000
Total Petroleum Hydrocarbons (SGT-HEM)	NA	210,000	210,000	210,000	7.9	0	210,000
Nonconventional Organics							
Benzoic Acid	65850	8,700	8,700	8,700	< 1	0	8,700
Hexanoic Acid	142621	200,000	200,000	200,000	< 1	0	200,000
TOTAL Nonconventional Organics		**210,000**	**210,000**	**210,000**	**< 1**	**0**	**210,000**
Other Nonconventionals							
Ammonia as Nitrogen	7664417	12,000	12,000	12,000	< 1	0	12,000
TOTAL Other Nonconventionals		**12,000**	**12,000**	**12,000**	**< 1**	**0**	**12,000**

Table 11-10 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 2 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)	Option 2 Pollutant Reduction from Baseline (lb/yr)
Priority Organics							
Phenol	108952	890	890	890	< 1	0	890
TOTAL Priority Organics		**890**	**890**	**890**	**< 1**	**0**	**890**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-11

Truck/Petroleum Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
5-Day Biochemical Oxygen Demand	NA	15,000	15,000	0	15,000
Oil and Grease (HEM)	NA	37,000	30,000	0	30,000
Total Suspended Solids	NA	12,000	12,000	0	12,000
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	100,000	100,000	0	100,000
Total Dissolved Solids	NA	2,700	2,700	0	2,700
Total Organic Carbon	NA	7,200	7,200	0	7,200
Total Petroleum Hydrocarbons (SGT-HEM)	NA	260	260	0	260
Nonconventional Metals					
Aluminum	7429905	30	30	0	30
Barium	7440393	5.3	5.3	0	5.3
Boron	7440428	85	85	0	85
Calcium	7440702	240	240	0	240
Cobalt	7440484	1.2	1.2	0	1.2
Hexavalent Chromium	18540299	4.2	4.2	0	4.2
Iron	7439896	350	350	0	350
Magnesium	7439954	87	86	0	86
Manganese	7439965	9.2	9.2	0	9.2
Molybdenum	7439987	3.2	3.2	0	3.2

Table 11-11 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Phosphorus	7723140	5.2	5.2	0	5.2
Potassium	7440097	11	11	0	11
Sodium	7440235	4,100	4,100	0	4,100
Sulfur	7704349	14	14	0	14
Tantalum	7440257	< 1	< 1	0	< 1
Tin	7440315	1.5	1.5	0	1.5
Titanium	7440326	< 1	< 1	0	< 1
Tungsten	7440337	< 1	< 1	0	< 1
Vanadium	7440622	< 1	< 1	0	< 1
Zirconium	7440677	< 1	< 1	0	< 1
TOTAL Nonconventional Metals		**5,000**	**5,000**	**0**	**5,000**
Nonconventional Organics					
2-Isopropylnaphthalene	2027170	9.2	9.2	0	9.2
2-Methylnaphthalene	91576	8.2	8.2	0	8.2
Acetone	67641	810	800	0	800
Benzoic Acid	65850	38	38	0	38
Biphenyl	92524	< 1	< 1	0	< 1
Diphenyl Ether	101848	< 1	< 1	0	< 1
Hexanoic Acid	142621	13	13	0	13
m-Xylene	108383	36	36	0	36
Methyl Ethyl Ketone	78933	73	73	0	73
Methyl Isobutyl Ketone	108101	7.7	7.7	0	7.7
n-Hexacosane	630013	7.1	7.1	0	7.1

Table 11-11 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
n-Decane	124185	100	100	0	100
n-Octacosane	630024	5.0	5.0	0	5.0
n-Octadecane	593453	16	16	0	16
n-Eicosane	112958	37	36	0	36
n-Tetracosane	646311	7.6	7.6	0	7.6
n-Tetradecane	629594	23	23	0	23
n-Triacontane	638686	< 1	< 1	0	< 1
n-Hexadecane	544763	47	47	0	47
n-Dodecane	112403	76	76	0	76
n-Docosane	629970	7.0	7.0	0	7.0
o+p-Xylene	136777612	18	18	0	18
Pentamethylbenzene	700129	8.6	8.6	0	8.6
Tripropyleneglycol Methyl Ether	20324338	250	250	0	250
Vinyl Acetate	108054	8.3	8.3	0	8.3
TOTAL Nonconventional Organics		**1,600**	**1,600**	**0**	**1,600**

Table 11-11 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Other Nonconventionals					
Ammonia as Nitrogen	7664417	830	830	0	830
Fluoride	16984488	86	86	0	86
TOTAL Other Nonconventionals		**920**	**920**	**0**	**920**
Other Priority Pollutants					
Total Cyanide	57125	< 1	< 1	0	< 1
TOTAL Other Priority Pollutants		**< 1**	**< 1**	**0**	**< 1**
Priority Metals					
Antimony	7440360	< 1	< 1	0	< 1
Arsenic	7440382	< 1	< 1	0	< 1
Beryllium	7440417	< 1	< 1	0	< 1
Cadmium	7440439	< 1	< 1	0	< 1
Chromium	7440473	3.0	3.0	0	3.0
Copper	7440508	26	26	0	26
Lead	7439921	18	18	0	18
Mercury	7439976	< 1	< 1	0	< 1
Nickel	7440020	93	93	0	93
Selenium	7782492	< 1	< 1	0	< 1
Silver	7440224	< 1	< 1	0	< 1
Thallium	7440280	< 1	< 1	0	< 1
Zinc	7440666	26	26	0	26
TOTAL Priority Metals		**170**	**170**	**0**	**170**
Priority Organics					

Table 11-11 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
1,2-Dichloroethane	107062	1.5	1.5	0	1.5
1,1,1-Trichloroethane	71556	7.2	7.2	0	7.2
4-Chloro-3-Methylphenol	59507	39	39	0	39
Benzene	71432	30	30	0	30
Bis (2-ethylhexyl) Phthalate	117817	< 1	< 1	0	< 1
Ethylbenzene	100414	23	23	0	23
Methylene Chloride	75092	4.9	4.9	0	4.9
Naphthalene	91203	7.8	7.7	0	7.7
Phenol	108952	6.0	6.0	0	6.0
Tetrachloroethylene	127184	2.1	2.1	0	2.1
Toluene	108883	120	120	0	120
Trichloroethylene	79016	1.6	1.5	0	1.5
TOTAL Priority Organics		**240**	**240**	**0**	**240**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-12

Rail/Petroleum Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
5-Day Biochemical Oxygen Demand	NA	56	56	0	56
Oil and Grease (HEM)	NA	140	81	0	81
Total Suspended Solids	NA	45	45	0	45
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	380	380	0	380
Total Dissolved Solids	NA	9.9	9.8	0	9.8
Total Organic Carbon	NA	27	26	0	26
Total Petroleum Hydrocarbons (SGT-HEM)	NA	< 1	< 1	0	< 1
Nonconventional Metals					
Aluminum	7429905	< 1	< 1	0	< 1
Barium	7440393	< 1	< 1	0	< 1
Boron	7440428	< 1	< 1	0	< 1
Calcium	7440702	< 1	< 1	0	< 1
Cobalt	7440484	< 1	< 1	0	< 1
Hexavalent Chromium	18540299	< 1	< 1	0	< 1
Iron	7439896	1.3	1.3	0	1.3
Magnesium	7439954	< 1	< 1	0	< 1
Manganese	7439965	< 1	< 1	0	< 1
Molybdenum	7439987	< 1	< 1	0	< 1
Phosphorus	7723140	< 1	< 1	0	< 1

Table 11-12 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Potassium	7440097	< 1	< 1	0	< 1
Sodium	7440235	15	15	0	15
Sulfur	7704349	< 1	< 1	0	< 1
Tantalum	7440257	< 1	< 1	0	< 1
Tin	7440315	< 1	< 1	0	< 1
Titanium	7440326	< 1	< 1	0	< 1
Tungsten	7440337	< 1	< 1	0	< 1
Vanadium	7440622	< 1	< 1	0	< 1
Zirconium	7440677	< 1	< 1	0	< 1
TOTAL Nonconventional Metals		**18**	**18**	**0**	**18**
Nonconventional Organics					
2-Isopropylnaphthalene	2027170	< 1	< 1	0	< 1
2-Methylnaphthalene	91576	< 1	< 1	0	< 1
Acetone	67641	3.0	2.9	0	2.9
Benzoic Acid	65850	< 1	< 1	0	< 1
Biphenyl	92524	< 1	< 1	0	< 1
Diphenyl Ether	101848	< 1	< 1	0	< 1
Hexanoic Acid	142621	< 1	< 1	0	< 1
m-Xylene	108383	< 1	< 1	0	< 1
Methyl Ethyl Ketone	78933	< 1	< 1	0	< 1
Methyl Isobutyl Ketone	108101	< 1	< 1	0	< 1
n-Hexacosane	630013	< 1	< 1	0	< 1
n-Decane	124185	< 1	< 1	0	< 1
n-Octacosane	630024	< 1	< 1	0	< 1

Table 11-12 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
n-Octadecane	593453	< 1	< 1	0	< 1
n-Eicosane	112958	< 1	< 1	0	< 1
n-Tetracosane	646311	< 1	< 1	0	< 1
n-Tetradecane	629594	< 1	< 1	0	< 1
n-Triacontane	638686	< 1	< 1	0	< 1
n-Hexadecane	544763	< 1	< 1	0	< 1
n-Dodecane	112403	< 1	< 1	0	< 1
n-Docosane	629970	< 1	< 1	0	< 1
o+p-Xylene	136777612	< 1	< 1	0	< 1
Pentamethylbenzene	700129	< 1	< 1	0	< 1
Tripropyleneglycol Methyl Ether	20324338	< 1	< 1	0	< 1
Vinyl Acetate	108054	< 1	< 1	0	< 1
TOTAL Nonconventional Organics		**5.9**	**5.9**	**0**	**5.9**
Other Nonconventionals					
Ammonia as Nitrogen	7664417	3.1	3.0	0	3.0
Fluoride	16984488	< 1	< 1	0	< 1
TOTAL Other Nonconventionals		**3.4**	**3.4**	**0**	**3.4**

Table 11-12 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Other Priority Pollutants					
Total Cyanide	57125	< 1	< 1	0	< 1
TOTAL Other Priority Pollutants		**< 1**	**< 1**	**0**	**< 1**
Priority Metals					
Antimony	7440360	< 1	< 1	0	< 1
Arsenic	7440382	< 1	< 1	0	< 1
Beryllium	7440417	< 1	< 1	0	< 1
Cadmium	7440439	< 1	< 1	0	< 1
Chromium	7440473	< 1	< 1	0	< 1
Copper	7440508	< 1	< 1	0	< 1
Lead	7439921	< 1	< 1	0	< 1
Mercury	7439976	< 1	< 1	0	< 1
Nickel	7440020	< 1	< 1	0	< 1
Selenium	7782492	< 1	< 1	0	< 1
Silver	7440224	< 1	< 1	0	< 1
Thallium	7440280	< 1	< 1	0	< 1
Zinc	7440666	< 1	< 1	0	< 1
TOTAL Priority Metals		**< 1**	**< 1**	**0**	**< 1**
Priority Organics					
1,2-Dichloroethane	107062	< 1	< 1	0	< 1
1,1,1-Trichloroethane	71556	< 1	< 1	0	< 1
4-Chloro-3-Methylphenol	59507	< 1	< 1	0	< 1
Benzene	71432	< 1	< 1	0	< 1
Bis (2-ethylhexyl) Phthalate	117817	< 1	< 1	0	< 1

Table 11-12 (Continued)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Ethylbenzene	100414	< 1	< 1	0	< 1
Methylene Chloride	75092	< 1	< 1	0	< 1
Naphthalene	91203	< 1	< 1	0	< 1
Phenol	108952	< 1	< 1	0	< 1
Tetrachloroethylene	127184	< 1	< 1	0	< 1
Toluene	108883	< 1	< 1	0	< 1
Trichloroethylene	79016	< 1	< 1	0	< 1
TOTAL Priority Organics		**< 1**	**< 1**	**0**	**< 1**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-13

Truck/Hopper Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
Total Suspended Solids	NA	17,000	15,000	8,200	6,700
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	7,600	6,800	4,800	2,000
Nonconventional Metals					
Aluminum	7429905	180	160	76	88
Calcium	7440702	3,300	3,000	1,700	1,300
Iron	7439896	1,000	920	400	520
Manganese	7439965	34	30	15	16
Titanium	7440326	5.4	4.8	1.5	3.3
TOTAL Nonconventional Metals		**4,600**	**4,100**	**2,200**	**2,000**
Priority Metals					
Beryllium	7440417	< 1	< 1	< 1	< 1
Chromium	7440473	1.5	1.3	1.2	< 1
Zinc	7440666	3.0	2.7	1.5	1.2
TOTAL Priority Metals		**4.5**	**4.1**	**2.7**	**1.4**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-14

Rail/Hopper Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
Total Suspended Solids	NA	890	160	160	0
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	5,100	96	96	0
Nonconventional Metals					
Aluminum	7429905	17	1.5	1.5	0
Calcium	7440702	100	33	33	0
Iron	7439896	36	8.0	8.0	0
Manganese	7439965	1.5	< 1	< 1	0
Titanium	7440326	< 1	< 1	< 1	0
TOTAL Nonconventional Metals		**160**	**43**	**43**	**0**
Priority Metals					
Beryllium	7440417	< 1	< 1	< 1	0
Chromium	7440473	< 1	< 1	< 1	0
Zinc	7440666	< 1	< 1	< 1	0
TOTAL Priority Metals		**1**	**< 1**	**< 1**	**0**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

Table 11-15

Barge/Hopper Subcategory – Indirect Dischargers
Summary of Pollutant Loadings and Reductions by Technology Option (a)

Pollutant Name	CAS Number	Untreated Wastewater Pollutant Loading (lb/yr)	Baseline Wastewater Pollutant Loading (lb/yr)	Option 1 Wastewater Pollutant Loading (lb/yr)	Option 1 Pollutant Reduction from Baseline (lb/yr)
Bulk Conventionals					
Total Suspended Solids	NA	8,500	5,500	4,500	940
Bulk Nonconventionals					
Chemical Oxygen Demand	NA	3,900	3,200	2,700	550
Nonconventional Metals					
Aluminum	7429905	94	51	42	8.7
Calcium	7440702	1,700	1,100	920	190
Iron	7439896	530	270	220	46
Manganese	7439965	17	9.7	8.1	1.7
Titanium	7440326	2.7	< 1	< 1	< 1
TOTAL Nonconventional Metals		**2,400**	**1,400**	**1,200**	**250**
Priority Metals					
Beryllium	7440417	< 1	< 1	< 1	< 1
Chromium	7440473	< 1	< 1	< 1	< 1
Zinc	7440666	1.5	< 1	< 1	< 1
TOTAL Priority Metals		**2**	**2**	**1**	**< 1**

(a) All data are presented with two significant digits. Apparent inconsistencies in sums and differences are due to rounding.
NA - Not applicable.

12.0 NON-WATER QUALITY IMPACTS

Sections 304(b) and 306 of the Clean Water Act require EPA to consider the non-water quality environmental impacts of effluent limitations guidelines and standards. Therefore, EPA evaluated the effects of the Transportation Equipment Cleaning Industry (TECI) proposed regulatory options on energy consumption, air pollution, and solid waste generation. Sections 12.1 through 12.3 discuss these impacts and Section 12.4 lists references for this section. Reference 1 summarizes the results of these analyses. In addition to these non-water quality impacts, EPA considered the impacts of the proposed rule on noise pollution and water and chemical use and determined these impacts to be negligible.

12.1 Energy Impacts

Energy impacts resulting from the proposed regulatory options include energy requirements to operate wastewater treatment equipment such as aerators, pumps, and mixers. The Agency evaluated the annual increase in electrical power consumption for each regulatory option relative to the estimated current industry consumption for wastewater treatment.

Flow reduction technologies (a component of the proposed regulatory options) reduce energy requirements by reducing the number of operating hours per day and/or operating days per year for wastewater treatment equipment currently operated by the TECI. For some regulatory options, energy savings resulting from flow reduction exceed requirements for operation of additional wastewater treatment equipment, resulting in a net energy savings for these options.

Based on EPA's proposed options (see Section 9.0), the Agency estimates a net increase in electricity use for the TECI as a result of the proposed rule would be approximately 6 million kilowatt hours per year. In 1990, the total U.S. industrial electrical energy purchase was approximately 756 billion kilowatt hours (2). EPA's proposed options would increase U.S. industrial electrical energy purchase by 0.0008 percent. Therefore, the Agency concludes that the effluent pollutant reduction benefits from the proposed technology options exceed the potential adverse effects from the estimated increase in energy consumption.

12.2 Air Emission Impacts

Transportation equipment cleaning (TEC) facilities generate volatile and semivolatile organic pollutants, some of which are also on the list of Hazardous Air Pollutants in Title 3 of the Clean Air Act Amendments of 1990. Air emissions from TEC facilities occur at several stages of the equipment cleaning process. Prior to cleaning, tanks which have transported volatile materials may be opened and vented with or without steam in a process called gas freeing. At some facilities, tanks are filled to capacity with water to displace vapors to the atmosphere or to a combustion device. Tanks are then cleaned, typically using either heated cleaning solutions or hot water. For recirculated cleaning solutions, pollutants may be volatilized from heated cleaning solution storage tanks. For TEC wastewater, pollutants may volatilize as the wastewater falls onto the cleaning bay floor, flows to floor drains and collection sumps, and conveys to wastewater treatment. TEC wastewater typically passes through treatment units open to the atmosphere where further pollutant volatilization may occur.

EPA performed a WATER8 (3) model analysis to determine the quantity of air emissions that would result from the proposed treatment technology options. Reference 4 describes EPA's model analysis in detail. EPA estimates that the maximum increase in air emissions would be 148,000 kilograms per year. EPA therefore concluded that the incremental air emissions resulting from the proposed wastewater treatment technology options are a small percentage of the total air emissions generated by TEC facilities.

12.3 Solid Waste Impacts

Solid waste impacts resulting from the proposed regulatory options include additional solid wastes generated by wastewater treatment technologies. These solid wastes consist of wastewater treatment residuals, including sludge, waste oil, spent activated carbon, and spent organo-clay. These impacts are discussed below in Sections 12.3.1 through 12.3.4 respectively.

12.3.1 Wastewater Treatment Sludge

Wastewater treatment sludge is generated in two forms: dewatered sludge (or filter cake) generated by a filter press and/or wet sludge generated by treatment units such as oil/water separators, chemical precipitation/coagulation, coagulation/clarification, dissolved air flotation, and biological treatment. The Agency evaluated impacts of the increased sludge generation for each regulatory option relative to the estimated current industry wastewater treatment sludge generation.

Many facilities that currently operate wastewater treatment systems do not dewater wastewater treatment sludge. Storage, transportation, and disposal of relatively large volumes of undewatered sludge that would be generated after implementing the TECI regulatory options is less cost-effective than dewatering sludge on site and disposing the greatly reduced volume of resulting filter cake. However, following implementation of these regulations, EPA believes TEC facilities would install sludge dewatering equipment to handle increases in sludge generation. For these reasons, EPA estimates net decreases in the volume of wet sludge generated by the industry and net increases in the volume of dry sludge generated by the industry.

Based on responses to the Detailed Questionnaire, most TEC facilities currently dispose wastewater treatment sludge in nonhazardous landfills. Sludge characterization data provided by industry and collected during EPA's TECI sampling program confirm that wastewater treatment sludge generated by the TECI is nonhazardous as determined by the Toxicity Characteristic Rule under the Resource Conservation and Recovery Act. Compliance cost estimates for the TECI regulatory options are based on disposal of wastewater treatment sludge in nonhazardous waste landfills.

The Agency concludes that the effluent benefits and the reductions in wet sludge from the proposed technology options exceed the potential adverse effects from the estimated increase in wastewater treatment sludge generation.

12.3.2 Waste Oil

EPA estimates that compliance with this regulation will result in an increase in waste oil generation at TEC sites based on removal of oil from wastewater via oil/water separation. The Agency evaluated the impacts of the increased waste oil generation for each regulatory option relative to the estimated current industry waste oil generation. The increase in waste oil generation is attributed to the removal of oil from TEC wastewaters prior to discharge to publicly-owned treatment works or surface waters. This increase reflects a transfer of oil from the wastewater to a more concentrated waste oil, and does not reflect an increase in overall oil generation at TEC sites.

EPA assumes, based on responses to the Detailed Questionnaire, that waste oil will be disposed via oil reclamation or fuels blending on or off site. Therefore, the Agency does not estimate any adverse effects from increase waste oil generation.

12.3.3 Spent Activated Carbon

Spent activated carbon is generated by the following regulatory options:

- Truck/Chemical Subcategory - BPT Option 2;
- Truck/Chemical Subcategory - PSES Option 2;
- Rail/Chemical Subcategory - BPT Option 3;
- Rail/Chemical Subcategory - PSES Option 3;
- Truck/Petroleum Subcategory - PSES Option 2; and
- Rail/Petroleum Subcategory - PSES Option 2.

Treatment of TEC wastewater via these technology options will generate 16,940,000 pounds (8,470 tons) annually of spent activated carbon. EPA assumes that the spent activated carbon will be sent off site for regeneration rather than disposed of as a waste. Possible air emissions during regeneration are minimal. Therefore, the Agency does not estimate any adverse effects from activated carbon treatment technologies.

12.3.4 Spent Organo-Clay

Spent organo-clay is generated by the following options:

- Rail/Chemical Subcategory - BPT Option 3; and
- Rail/Chemical Subcategory - PSES Option 3.

Treatment of TEC wastewater via these technology options will generate 236,000 pounds (118 tons) annually of spent organo-clay. EPA assumes that the spent organo-clay will be disposed as a nonhazardous waste. The Agency concludes that the effluent benefits from the proposed technology options exceed any potential adverse effects from the generation and disposal of spent organo-clay.

12.4 References[1]

1. Eastern Research Group, Inc. Summary of the Results of Non-Water Quality Impacts Analyses. Memorandum from Michelle DeCaire, Eastern Research Group, Inc. to the TECI Rulemaking Record. May 26, 1998 (DCN T10300).

2. U.S. Department of Commerce. 1990 Annual Survey of Manufacturers, Statistics for Industry Groups and Industries. M90 (AS)-1, March 1992.

3. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Wastewater Treatment Compound Property Processor and Air Emissions Estimator (WATER8), Version 4.0. U.S. Environmental Protection Agency, Research Triangle Park, NC, May 1, 1995.

4. Eastern Research Group, Inc. WATER8 Analysis of Air Emission Impacts of TECI Regulatory Options. May 1998 (DCN T04660).

[1] For those references included in the administrative record supporting the proposed TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

13.0 IMPLEMENTATION OF PROPOSED EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

Using annual average production information supplied by the facility and the effluent guidelines, the permitting authority will establish numerical discharge limitations for the facility and specify monitoring and reporting requirements. For direct discharging facilities, the effluent limitation guidelines are applicable to the final effluent discharged to U.S. surface waters. For indirect discharging facilities, pretreatment standards are applicable to the final effluent discharged to a publicly-owned treatment works.

For the proposed regulations, the production rate is defined as the number of tanks cleaned annually divided by the number of days that the facility performs transportation equipment cleaning (TEC) operations during that year. Facility production in each subcategory is used with the subcategory production normalized mass effluent limitations guidelines and standards to calculate facility-specific permit limitations. Permitting authorities must determine production based on past production practices, present trends, or committed growth. Permitting authorities have typically used average production over the past five years to represent past production practices. In certain circumstances, however, evaluating production for the past five years may not be appropriate. For example, if a facility significantly increased the number of tanks cleaned within the past two years, permitting authorities should average the production for only the past two years.

EPA has structured the proposed regulation in a building-block approach. This means that the applicable permit limitations for facilities with production in more than one subcategory will be the sum of the mass loadings based upon production in each subcategory and the respective subcategory effluent limitations guidelines. Examples of facilities that fall under one and more than one subcategory are provided below.

Example 1:

Facility 1 cleaned 1,000 tank trucks in 1996. 1996 was the highest production year in the past five years and during that year the facility performed TEC operations 250 days. Of these 1,000 tanks, 500 (50%) last transported petroleum cargos, 300 (30%) last transported food grade cargos, and 200 (20%) last transported chemical cargos. From the definitions provided in Section 5.2, all production at facility 1 falls under Subcategory A - Truck/Chemical (i.e., facilities that clean tank trucks and intermodal tank containers where 10% or more of the total tanks cleaned at that facility in an average year contained chemical cargos). The production rate for the purpose of calculating limitations is:

$$\text{PRODRATE} = \frac{\text{PROD}}{\text{OPDAYS}} \qquad (1)$$

where:

PRODRATE	=	Production rate, tanks/day
PROD	=	Highest number of tanks cleaned annually in the past five years, tanks/year
OPDAYS	=	Number of TEC operating days in the calendar year used for PROD, days

Using Equation 1:

$$\frac{1{,}000 \text{ tanks / year}}{250 \text{ days / year}} = 4 \text{ tanks / day}$$

As an example, from Table 2-4, the BPT effluent guidelines for biochemical oxygen demand (BOD_5) and total suspended solids (TSS) for the Truck/Chemical Subcategory are:

Subcategory	Daily Maximum (grams/tank)		Monthly Average (grams/tank)	
	BOD_5	TSS	BOD_5	TSS
Truck/Chemical	145	281	67.6	115

Permit limitations are calculated as follows.

Daily Maximum BOD_5:

$$145 \text{ grams/tank} \times 4 \text{ tanks/day} = 580 \text{ grams } BOD_5\text{/day}$$

Daily Maximum TSS:

$$281 \text{ grams/tank} \times 4 \text{ tanks/day} = 1{,}124 \text{ grams TSS/day}$$

Monthly Average BOD_5:

$$67.6 \text{ grams/tank} \times 4 \text{ tanks/day} = 270.4 \text{ grams } BOD_5\text{/day}$$

Monthly Average TSS:

$$115 \text{ grams/tank} \times 4 \text{ tanks/day} = 460 \text{ grams TSS/day}$$

<u>Example 2:</u>

Facility 2 cleaned 1,000 rail tank cars and 500 tank barges in 1996. 1996 was the highest production year in the past five years and during that year the facility performed TEC operations 250 days. Of the 1,000 rail tank cars, 950 (95%) last transported food grade cargos and 50 (5%) last transported chemical cargos. Of the 500 tank barges, 300 (60%) last transported chemical cargos and 200 (40%) last transported petroleum cargos. From the definitions provided in Section 5.2, production at facility 2 falls under both Subcategory E - Rail/Food (i.e., facilities that clean rail tank cars where 10% or more of the total tanks cleaned at that facility in an average year contained food grade cargos, so long as that facility does not clean 10% or more of tanks containing chemical cargos) and Subcategory C - Barge/Chemical & Petroleum (i.e., facilities that clean tank barges or ocean/sea tankers where 10% or more of the total tanks cleaned at that facility in an average year contained chemical and/or petroleum cargos).

Using Equation 1, the production rate for the purpose of calculating limitations is:

$$\frac{1{,}000 \text{ tanks / year}}{250 \text{ days / year}} = 4 \text{ tanks / day Rail / Food Subcategory production}$$

$$\frac{500 \text{ tanks / year}}{250 \text{ days / year}} = \begin{array}{c}\text{2 tanks / day Barge / Chemical \& Petroleum} \\ \text{Subcategory production}\end{array}$$

As an example, from Tables 2-6 and 2-8, respectively, the BPT effluent guidelines for BOD_5 and TSS for the Barge/Chemical & Petroleum and Rail/Food Subcategories are:

	Daily Maximum (grams/tank)		Monthly Average (grams/tank)	
Subcategory	**BOD_5**	**TSS**	**BOD_5**	**TSS**
Barge/Chemical & Petroleum	18,300	9,540	8,600	6,090
Rail/Food	945	3,830	412	1,460

Permit limitations are calculated as follows.

Daily Maximum BOD_5:

18,300 grams/tank × 2 tanks/day = 36,600 grams/day

945 grams/tank × 4 tanks/day = 3,780 grams/day

36,600 + 3,780 = 40,380 grams BOD_5/day

Daily Maximum TSS:

9,540 grams/tank × 2 tanks/day = 19,080 grams/day

3,830 grams/tank × 4 tanks/day = 15,320 grams/day

19,080 + 15,320 = 34,400 grams TSS/day

Monthly Average BOD_5:

$$8{,}600 \text{ grams/tank} \times 2 \text{ tanks/day} = 17{,}200 \text{ grams/day}$$

$$412 \text{ grams/tank} \times 4 \text{ tanks/day} = 1{,}648 \text{ grams/day}$$

$$17{,}200 + 1{,}648 = 18{,}848 \text{ grams } BOD_5\text{/day}$$

Monthly Average TSS:

$$6{,}090 \text{ grams/tank} \times 2 \text{ tanks/day} = 12{,}180 \text{ grams/day}$$

$$1{,}460 \text{ grams/tank} \times 4 \text{ tanks/day} = 5{,}840 \text{ grams/day}$$

$$12{,}180 + 5{,}840 = 18{,}020 \text{ grams TSS/day}$$

14.0 ANALYTICAL METHODS

Section 304(h) of the Clean Water Act directs EPA to promulgate guidelines establishing test procedures (analytical methods) for analyzing pollutants. These test procedures are used to determine the presence and concentration of pollutants in wastewater, and are used for filing applications and for compliance monitoring under the National Pollutant Discharge Elimination System (NPDES) found at 40 CFR Parts 122.41(j)(4) and 122.21(g)(7), and for the pretreatment program found at 40 CFR 403.7(d). Promulgation of these methods is intended to standardize analytical methods within specific industrial categories and across industries.

EPA has promulgated analytical methods for monitoring pollutant discharges at 40 CR Part 136, and has promulgated methods for analytes specific to given industrial categories at 40 CFR Parts 400 to 480. In addition to the methods developed by EPA and promulgated at 40 CFR Part 136, certain methods developed by others[1] have been incorporated by reference into 40 CFR Part 136.

The analytical method for Oil and Grease and Total Petroleum Hydrocarbons (TPH) is currently being revised to allow for the use of normal hexane in place of Freon 113, a chlorofluorocarbon (CFC). Method 1664 will replace the current Oil and Grease Method 413.1 found in 40 CFR 136. In anticipation of promulgation of method 1664, data collected by EPA in support of the TECI effluent guideline utilized method 1664. Therefore, all effluent limitations proposed for Oil and Grease and TPH in this effluent guideline are to be measured by Method 1664.

For this proposed rule, EPA intends to regulate certain conventional, priority, and nonconventional pollutants as identified in Section 7.0. The methods proposed for monitoring the regulated pollutants are briefly discussed in the following sections:

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[1] For example, the American Public Health Association publishes *Standard Methods for the Examination of Water and Wastewater*.

- Section 14.1: Semivolatile Organic Compounds;
- Section 14.2: Metals;
- Section 14.3: Hexane Extractable Material and Silica-Gel Treated Hexane Extractable Material;
- Section 14.4: Chemical Oxygen Demand;
- Section 14.5: Biochemical Oxygen Demand; and
- Section 14.6: Total Suspended Solids.

Section 14.7 lists the references used in this section.

14.1 Semivolatile Organic Compounds

Semivolatile organic compounds are analyzed by EPA Method 1625, Revision C (1). In this method, samples are prepared by liquid-liquid extraction with methylene chloride in a separatory funnel or continuous liquid-liquid extractor. Separate acid and base/neutral extracts are concentrated and analyzed by high resolution gas chromatography (HRGC) combined with low resolution mass spectrometry (LRMS). The detection limit of the method is usually dependent upon interferences rather than instrument limitations. With no interferences present, minimum levels of 10, 20, or 50 µg/L (ppb) can be achieved, depending upon the specific compound.

14.2 Metals

Metals are analyzed by EPA Method 1620 (2). This method is a consolidation of the EPA 200 series methods for the quantitative determination of 27 trace elements by inductively coupled plasma (ICP) and graphite furnace atomic adsorption (GFAA), and determination of mercury by cold vapor atomic absorption (CVAA). The method also provides a semiquantitative ICP screen for 42 additional elements. The ICP technique measures atomic emissions by optical spectroscopy. GFAA measures the atomic absorption of a vaporized sample, and CVAA measures the atomic absorption of mercury vapor. Method detection limits (MDLs) are influenced by the sample matrix and interferences. With no interferences present, compound-specific MDLs ranging from 0.1 to 75 μg/L (ppb) can be achieved.

14.3 Hexane Extractable Material and Silica-Gel Treated Hexane Extractable Material

Hexane Extractable Material (HEM; formerly known as oil and grease) and Silica-Gel Treated Hexane Extractable Material (SGT-HEM; formerly known as total petroleum hydrocarbons) are analyzed by EPA Method 1664 (3). In this method, a 1-L sample is acidified and serially extracted three times with n-hexane. The solvent is evaporated from the extract and the HEM is weighed. For SGT-HEM analysis, the HEM is redissolved in n-hexane and an amount of silica gel proportionate to the amount of HEM is added to the HEM solution to remove adsorbable materials. The solution is filtered to remove the silica gel, the solvent is evaporated, and the SGT-HEM is weighed. This method is capable of measuring HEM and SGT-HEM in the range of 5 to 1,000 mg/L (ppm), and may be extended to higher concentrations by analysis of a smaller sample volume.

14.4 Chemical Oxygen Demand

Chemical oxygen demand (COD) is a measure of the oxygen equivalent of the organic matter in a sample that is susceptible to oxidation by a strong chemical oxidant. COD is measured by EPA Methods 410.1, 410.2, 410.3, and 410.4 (4). These methods are incorporated by reference into 40 CFR Part 136. In Methods 410.1, 410.2, and 410.3, the organic and oxidizable inorganic substances in an aqueous sample are oxidized by a solution of potassium dichromate in sulfuric acid. The excess dichromate is titrated with standard ferrous ammonium sulfate using orthophenanthroline ferrous complex (ferroin) as an indicator. Method 410.1 covers COD concentrations in the range of 50 - 2,000 mg/L (ppm) whereas Method 410.2 covers

COD concentrations from 5 - 50 mg/L. Method 410.3 is intended for high levels of COD in saline waters and is generally not applicable to TEC wastewaters.

In Method 410.4, COD is determined colorimetrically after digestion of the organic matter in a sample using hot chromic acid solution. Note that highly colored samples may interfere with the colorimetric determination of COD, in which case Methods 410.1 or 410.2 are used.

14.5 Biochemical Oxygen Demand

Biochemical oxygen demand (BOD_5) is a measure of the relative oxygen requirements of wastewaters, effluents, and polluted waters. BOD_5 is measured by EPA Method 405.1 (4). The BOD_5 test specified in this method is an empirical bioassay-type procedure that measures dissolved oxygen consumed by microbial life while assimilating and oxidizing the organic matter present. The standard test conditions include dark incubation at 20°C for a five-day period, and the reduction in dissolved oxygen concentration during this period yields a measure of the biological oxygen demand. The practical minimum level of determination is 2 mg/L (ppm).

14.6 Total Suspended Solids

Total suspended solids (TSS) is measured using EPA Method 160.2 (4). In this method, a well-mixed sample is filtered through a pre-weighed glass fiber filter. The filter is dried to constant weight at 103 -105°C. The weight of material on the filter divided by the sample volume is the amount of TSS. The practical range of the determination is 4 - 20,000 mg/L (ppm).

14.7 References[1]

1. U.S. Environmental Protection Agency. Method 1625, Revision C: Semivolatile Organic Compounds by Isotope Dilution GCMS, June 1989 (DCN T10220).

2. U.S. Environmental Protection Agency. Method 1620: Metals by Inductively Coupled Plasma Atomic Emission Spectroscopy and Atomic Absorption Spectroscopy, September 1989 (DCN T10224).

3. U.S. Environmental Protection Agency. Method 1664: n-Hexane Extractable Material (HEM) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM) by Extraction and Gravimetry (Oil and Grease and Total Petroleum Hydrocarbons), EPA-821-B-94-004b, April 1995. (DCN T10227).

4. U.S. Environmental Protection Agency. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983. (DCN T10228).

[1] For those references included in the administrative record supporting the proposed TECI rulemaking, the document control number (DCN) is included in parentheses at the end of the reference.

15.0 GLOSSARY

Administrator - The Administrator of the U.S. Environmental Protection Agency.

Agency - The U.S. Environmental Protection Agency.

Ballast Water Treatment Facility - A facility which accepts for treatment ballast water or any water which has contacted the interior of cargo spaces or tanks in an ocean/sea tanker.

Baseline Loadings - Pollutant loadings in TEC wastewater currently being discharged to POTWs or U.S. surface waters. These loadings take into account wastewater treatment currently in place at TEC facilities.

BAT - The best available technology economically achievable, as described in Sec. 304(b)(2) of the Clean Water Act.

BCT - The best conventional pollutant control technology, as described in Sec. 304(b)(4) of the Clean Water Act.

BMP - Best Management Practice. Section 304(e) of the Clean Water Act gives the Administrator the authority to publish regulations to control plant site runoff, spills, or leaks, sludge or waste disposal, and drainage from raw material storage.

BOD_5 - Five day biochemical oxygen demand. A measure of biochemical decomposition of organic matter in a water sample. It is determined by measuring the dissolved oxygen consumed by microorganisms to oxidize the organic matter in a water sample under standard laboratory conditions of five days and 20° C, see Method 405.1. BOD_5 is not related to the oxygen requirements in chemical combustion.

BPT - The best practicable control technology currently available, as described in Sec. 304(b)(1) of the Clean Water Act.

Builder/Leaser - A facility that manufactures and/or leases tank trucks, closed-top hopper tank trucks, intermodal tank containers, rail tank cars, closed-top hopper rank tank cars, inland tank barges, closed-top hopper barges, and/or ocean/sea tankers, and that cleans the interiors of these tank after equipment has been placed in service.

CAA - Clean Air Act. The Air Pollution Prevention and Control Act (42 U.S.C. 7401 et. seq.), as amended, inter alia, by the Clean Air Act Amendments of 1990 (Public Law 101-549, 104 Stat. 2399).

Cargo - Any chemical, material, or substance transported in a tank truck, closed-top hopper truck, intermodal tank container, rail tank car, closed-top hopper rail car, inland tank barge, closed-top inland hopper barge, ocean/sea tanker, or a similar tank that comes in direct contact with the chemical, material, or substance. A cargo may also be referred to as a commodity.

Carrier-Operated (Carrier) - A facility that owns, operates, and cleans a tank fleet used to transport commodities or cargos for other companies.

Centralized Waste Treater (CWT) - A facility that recycles, reclaims, or treats any hazardous or nonhazardous industrial wastes received from off site and/or wastes generated on site by the facility.

Centralized Waste Treaters Effluent Guideline - see proposed 40 CFR Part 437, 60 FR 5464, January 27, 1995.

CFR - Code of Federal Regulations, published by the U.S. Government Printing Office. A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.

Closed-Top Hopper Rail Car- A completely enclosed storage vessel pulled by a locomotive that is used to transport dry bulk commodities or cargos over railway access lines. Closed-top hopper rail cars are not designed or contracted to carry liquid commodities or cargos and are typically used to transport grain, soybeans, soy meal, soda ash, fertilizer, plastic pellets, flour, sugar, and similar commodities or cargos. The commodities or cargos transported come in direct contact with the hopper interior. Closed-top hopper rail cars are typically divided into three compartments, carry the same commodity or cargo in each compartment, and are generally top loaded and bottom unloaded. The hatch covers on closed-top hopper rail cars are typically longitudinal hatch covers or round manhole covers.

Closed-Top Hopper Truck - A motor-driven vehicle with a completely enclosed storage vessel used to transport dry bulk commodities or cargos over roads and highways. Closed-top hopper trucks are not designed or constructed to carry liquid commodities or cargos and are typically used to transport grain, soybeans, soy meal, soda ash, fertilizer, plastic pellets, flour, sugar, and similar commodities or cargos. The commodities or cargos transported come in direct contact with the hopper interior. Closed-top hopper trucks are typically divided into three compartments, carry the same commodity or cargo in each compartment, and are generally top loaded and bottom unloaded. The hatch covers used on closed-top hopper trucks are typically longitudinal hatch covers or round manhole covers. Closed-top hopper trucks are also commonly referred to as dry bulk hoppers.

Closed-Top Hopper Barge - A self- or non-self-propelled vessel constructed or adapted primarily to carry dry commodities or cargos in bulk through inland rivers and waterways, and may occasionally carry commodities or cargos through oceans and seas when in transit from one inland waterway to another. Closed-top inland hopper barges are not designed to carry liquid commodities or cargos and are typically used to transport corn, wheat, soy beans, oats, soy meal, animal pellets, and similar commodities or cargos. The commodities or cargos transported come in direct contact with the hopper interior. The basic types of tops on closed-top inland hopper barges are telescoping rolls, steel lift covers, and fiberglass lift covers.

COD - Chemical oxygen demand. A nonconventional, bulk parameter that measures the oxygen-consuming capacity of refractory organic and inorganic matter present in water or wastewater. COD is expressed as the amount of oxygen consumed from a chemical oxidant in a specific test, see Method 410.1.

Commercial Facility - A facility that performs 50 percent of their cleanings for commercial customers. Many of these facilities perform 90 percent or more commercial cleanings.

Commodity - Any chemical, material, or substance transported in a tank truck, closed-top hopper truck, intermediate bulk container, rail tank car, closed-top hopper rail car, inland tank barge, closed-top inland hopper barge, ocean/sea tanker, or similar tank that comes in direct contact with the chemical, material, or substance. A commodity may also be referred to as a cargo.

Consignee - Customer or agent to whom commodities or cargos are delivered.

Contract Hauling - The removal of any waste stream from the facility by a company authorized to transport and dispose of the waste, excluding discharges to sewers of surface waters.

Conventional Pollutants - The pollutants identified in Sec. 304(a)(4) of the Clean Water Act and the regulations thereunder (i.e., biochemical oxygen demand (BOD_5), total suspended solids (TSS), oil and grease, fecal coliform, and pH).

CWA - Clean Water Act. The Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251 et seq.), as amended, <u>inter</u> <u>alia</u>, by the Clean Water Act of 1977 (Public Law 95-217) and the Water Quality Act of 1987 (Public Law 100-4).

Daily Discharge - The discharge of a pollutant measured during any calendar day or any 24-hour period that reasonably represents a calendar day.

Dairy Products Processing Effluent Guideline - see 40 CFR Part 405.

Detailed Questionnaire - The 1994 Detailed Questionnaire for the Transportation Equipment Cleaning Industry.

Direct Capital Costs - One-time capital costs associated with the purchase, installation, and delivery of a specific technology. Direct capital costs are estimated by the TECI cost model.

Direct Discharger - A facility that conveys or may convey untreated or facility-treated process wastewater or nonprocess wastewater directly into surface waters of the United States, such as rivers, lakes, or oceans. (See Surface Waters definition.)

Discharge - The conveyance of wastewater to: (1) United States surface waters such as rivers, lakes, and oceans, or (2) a publicly-owned, privately-owned, federally-owned, centralized, or other treatment works.

Drum - A metal or plastic cylindrical container with either an open-head or a tight-head (also known as bung-type top) used to hold liquid, solid, or gaseous commodities or cargos which are in direct contact with the container interior. Drums typically range in capacity from 30 to 55 gallons.

Dry Bulk Cargo - A cargo which includes dry bulk products such as fertilizers, grain, and coal.

EA - Economic assessment. An analysis which estimates the economic impacts of compliance costs on facilities, firms, employment, domestic and international market, inflation, distribution, environmental justice, and transportation equipment cleaning customers.

Effluent - Wastewater discharges.

Effluent Limitation - Any restriction, including schedules of compliance, established by a State or the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean. (CWA Sections 301(b) and 304(b).)

Emission - Passage of air pollutants into the atmosphere via a gas stream or other means.

EPA - The U.S. Environmental Protection Agency.

Facility - A facility is all contiguous property owned, operated, leased, or under the control of the same corporation or business entity. The contiguous property may be divided by public or private right-of-way.

Federally-Owned Treatment Works (FOTW) - Any device or system owned and/or operated by a United States Federal Agency to recycle, reclaim, or treat liquid sewage or liquid industrial wastes.

Food Grade Cargo - Food grade cargos include edible and non-edible food products. Specific examples of food grade products include but are not limited to: alcoholic beverages, animal by-products, animal fats, animal oils, caramel, caramel coloring, chocolate, corn syrup and other corn products, dairy products, dietary supplements, eggs, flavorings, food preservatives, food products that are not suitable for human consumption, fruit juices, honey, lard, molasses, non-alcoholic beverages, salt, sugars, sweeteners, tallow, vegetable oils, vinegar, and water.

FR - Federal Register, published by the U.S. Government Printing Office, Washington, D.C. A publication making available to the public regulations and legal notices issued by federal agencies.

Hazardous Air Pollutants (HAPs) - Substances listed by EPA as air toxics under Section 112 of the Clean Air Act.

Heel - Any material remaining in a tank or container following unloading, delivery, or discharge of the transported cargo. Heels may also be referred to as container residue, residual materials or residuals.

Hexane Extractable Material (HEM) - A method-defined parameter that measures the presence of relatively nonvolatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related materials that are extractable in the solvent n-hexane. The analytical method for Oil and Grease is currently being revised to allow for the use of normal hexane in place of Freon 113, a chlorofluorocarbon (CFC). Method 1664 (Hexane Extractable Material) will replace the current Oil and Grease Method 413.1 found in 40 CFR 136.

Independent - A facility that provides cleaning services on a commercial basis, either as a primary or secondary business, for tanks which they do not own or operate.

Indirect Capital Costs - One-time capital costs that are not technology-specific and are represented as a multiplication factor that is applied to the direct capital costs estimated by the TECI cost model.

Indirect Discharger - A facility that discharges or may discharge pollutants into a publicly-owned treatment works (POTW).

Industrial Waste Combusters Effluent Guidelines - see proposed 40 CFR Part 444, FR 6325, February 6, 1998.

In-house Facility - A facility that performs less than 50 percent of their cleanings for commercial clients. In-house TEC facilities primarily clean their own transportation equipment and have very few commercial clients. Most of these facilities perform less than 10 percent of their total cleanings for commercial clients.

Inland Tank Barge - A self- or non-self-propelled vessel constructed or adapted primarily to carry commodities or cargos in bulk in cargo spaces (or tanks) through rivers and inland waterways, and may occasionally carry commodities or cargos through oceans and seas when in transit from one inland waterway to another. The commodities or cargos transported are in direct contact with the tank interior. There are no maximum or minimum vessel or tank volumes.

Inorganic Chemicals Manufacturing Effluent Guidelines - see 40 CFR Part 415.

Intermediate Bulk Container (IBC or Tote) - A completely enclosed storage vessel used to hold liquid, solid, or gaseous commodities or cargos which are in direct contact with the tank interior. Intermediate bulk containers may be loaded onto flat beds for either truck or rail transport, or onto ship decks for water transport. IBCs are portable containers with 450 liters (119 gallons) to 3000 liters (793 gallons) capacity. IBCs are also commonly referred to as totes or tote bins.

Intermodal Tank Container - A completely enclosed storage vessel used to hold liquid, solid, or gaseous commodities or cargos which come in direct contact with the tank interior. Intermodal tank containers may be loaded onto flat beds for either truck or rail transport, or onto ship decks for water transport. Containers larger than 3000 liters capacity are considered intermodal tank containers. Containers smaller than 3000 liters capacity are considered IBCs.

MP&M - Metal Products & Machinery Effluent Guidelines, new regulation to be proposed in 2000.

New Source - As defined in 40 CFR 122.2 and 122.29, and 403.3(k), a new source is any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced (1) for purposes of compliance with New Source Performance Standards, after the promulgation of such standards under CWA Section 306; or (2) for the purposes of compliance with Pretreatment Standards for New Sources, after the publication of proposed standards under CWA Section 307(c), if such standards are thereafter promulgated in accordance with that section.

Nonconventional Pollutant - Pollutants that are neither conventional pollutants nor priority toxic pollutants listed at 40 CFR Section 401.

Nondetect Value - A concentration-based measurement reported below the sample-specific detection limit that can reliably be measured by the analytical method for the pollutant.

Nonprocess Wastewater - Wastewater that is not generated from industrial processes or that does not come into contact with process wastewater. Nonprocess wastewater includes, but is not limited to, wastewater generated from restrooms, cafeterias, and showers.

Non-Water Quality Environmental Impact - An environmental impact of a control or treatment technology, other than to surface waters.

NPDES - The National Pollutant Discharge Elimination System authorized under Sec. 402 of the CWA. NPDES requires permits for discharge of pollutants from any point source into waters of the United States.

NRDC - Natural Resources Defense Council.

NSPS - New source performance standards, under Sec. 306 of the CWA.

Ocean/Sea Tanker - A self- or non-self-propelled vessel constructed or adapted to transport commodities or cargos in bulk in cargo spaces (or tanks) through oceans and seas, where the commodity or cargo carried comes in direct contact with the tank interior. There are no maximum or minimum vessel or tank volumes.

OCPSF - Organic Chemicals, Plastics, and Synthetic Fibers Manufacturing Effluent Guideline, see 40 CFR Part 414.

Off Site - "Off site" means outside the bounds of the facility.

Oil and Grease (O&G) - A method-defined parameter that measures the presence of relatively nonvolatile hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related materials that are extractable in Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane). The analytical method for Oil and Grease and Total Petroleum Hydrocarbons (TPH) is currently being revised to allow for the use of normal hexane in place of Freon 113, a chlorofluorocarbon (CFC). Method 1664 (Hexane Extractable Material) will replace the current Oil and Grease Method 413.1 found in 40 CFR 136. In anticipation of promulgation of Method 1664, data collected by EPA in support of the TECI effluent guideline utilized Method 1664. Therefore, all effluent limitations proposed for Oil and Grease and TPH in this effluent guideline are to be measured by Method 1664.

On Site - "On site" means within the bounds of the facility.

Operating and Maintenance (O&M) Costs - All costs related to operating and maintaining a treatment system for a period of one year, including the estimated costs for compliance wastewater monitoring of the effluent.

Petroleum Cargo - Petroleum cargos include the products of the fractionation or straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking, or other refining processes. For purposes of this rule, petroleum cargos also include products obtained from the refining or processing of natural gas and coal. For purposes of this rule, specific examples of petroleum products include but are not limited to: asphalt; benzene; coal tar; crude oil; cutting oil; ethyl benzene; diesel fuel; fuel additives; fuel oils; gasoline; greases; heavy, medium, and light oils; hydraulic fluids, jet fuel; kerosene; liquid petroleum gases (LPG) including butane and propane; lubrication oils; mineral spirits; naphtha; olefin, paraffin, and other waxes; tall oil; tar; toluene; xylene; and waste oil.

Petroleum Refining Effluent Guidelines - see 40 CFR Part 415.

PNPL - Production Normalized Pollutant Loading. Untreated wastewater pollutant loading generated per tank cleaning.

Point Source Category - A category of sources of water pollutants.

Pollutants Effectively Removed - Non-pesticide/herbicide pollutants that meet the following criteria are considered effectively removed: detected two or more times in the subcategory influent, an average treatment technology option influent concentration greater than or equal to five times their analytical method detection limit, and a removal rate of 50 percent or greater by the treatment technology option. Pesticide/herbicide pollutants that meet the following criteria are considered effectively removed: detected in the subcategory influent one or more times at a concentration above the analytical method detection limit, and a removal rate of greater than zero by the treatment technology option. All pollutants effectively removed were used in the environmental assessment and cost effectiveness analyses.

Pollution Prevention - The use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes. It includes practices that reduce the use of hazardous and nonhazardous materials, energy, water, or other resources, as well as those practices that protect natural resources through conversation or more efficient use. Pollution prevention consists of source reduction, in-process recycle and reuse, and water conservation practices.

Post-Compliance Loadings - Pollutant loadings in TEC wastewater following implementation of each regulatory option. These loadings are calculated assuming that all TEC facilities would operate wastewater treatment technologies equivalent to the technology bases for the selected regulatory options.

POTW - Publicly-owned treatment works, as defined at 40 CFR 403.3(o).

PPA - Pollution Prevention Act. The Pollution Prevention Act of 1990 (42 U.S.C. 13101 et. seq., Pub. Law 101-508), November 5, 1990.

Prerinse - Within a TEC cleaning process, a rinse, typically with hot or cold water, performed at the beginning of the cleaning sequence to remove residual material from the tank interior.

Presolve Wash - Use of diesel, kerosene, gasoline, or any other type of fuel or solvent as a tank interior cleaning solution.

Pretreatment Standard - A regulation that establishes industrial wastewater effluent quality required for discharge to a POTW. (CWA Section 307(b).)

Previously Regulated Facility - Any TEC facility that has major process wastewater streams that are covered by other effluent guidelines. TEC operations are usually a very small part of their overall operation. These facilities include organic chemical manufacturers (OCPSF Effluent Guideline), centralized waste treaters (CWT Effluent Guideline), dairies (Dairies Effluent Guideline), and incinerators (Incinerators Effluent Guideline).

Priority Pollutants - The pollutants designated by EPA as priority in 40 CFR Part 423, Appendix A.

Privately-Owned Treatment Works - Any device or system owned and operated by a private company that is used to recycle, reclaim, or treat liquid industrial wastes not generated by that company.

Process Wastewater - Any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

PSES - Pretreatment standards for existing sources, under Sec. 307(b) of the CWA.

PSNS - Pretreatment standards for new sources, under Sec. 307(b) and (c) of the CWA.

Rail Tank Car - A completely enclosed storage vessel pulled by a locomotive that is used to transport liquid, solid, or gaseous commodities or cargos over railway access lines. A rail tank car storage vessel may have one or more storage compartments, and the stored commodities or cargos come in direct contact with the tank interior. There are no maximum or minimum vessel or tank volumes.

RCRA - Resource Conservation and Recovery Act (PL 94-580) of 1976, as amended (42 U.S.C. 6901, et. seq.).

RREL - Risk Reduction Engineering Laboratory.

Screener Questionnaire - The 1993 Screener Questionnaire for the Transportation Equipment Cleaning Industry.

Shipper-Operated (Shipper) - A facility that transports or engages a carrier for transport of their own commodities or cargos and cleans the fleet used for such transport. Also included in the scope of this definition are facilities which provide tank cleaning services to fleets that transport raw materials to their location.

SIC - Standard industrial classification. A numerical categorization system used by the U.S. Department of Commerce to catalogue economic activity. SIC codes refer to the products, or group of products, produced or distributed, or to services rendered by an operating establishment. SIC codes are used to group establishments by the economic activities in which they are engaged. SIC codes often denote a facility's primary, secondary, tertiary, etc. economic activities.

Silica Gel Treated Hexane Extractable Material (SGT-HEM) - A method-defined parameter that measures the presence of mineral oils that are extractable in the solvent n-hexane and not adsorbed by silica gel. The analytical method for Total Petroleum Hydrocarbons (TPH) and Oil and Grease is currently being revised to allow for the use of normal hexane in place of Freon 113, a chlorofluorocarbon (CFC). Method 1664 (Hexane Extractable Material) will replace the current Oil and Grease Method 413.1 found in 40 CFR 136. In anticipation of promulgation of Method 1664, data collected by EPA in support of the TECI effluent guideline utilized Method 1664.

Therefore, all effluent limitations proposed for Oil and Grease and TPH in this effluent guideline are to be measured by Method 1664.

Source Reduction - Any practice which reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment prior to recycling, treatment, or disposal. Source reduction can include equipment or technology modifications, process or procedure modifications, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

Surface Waters - Waters including, but not limited to, oceans and all interstate and intrastate lakes, rivers, streams, mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, and natural ponds.

Tank - A generic term used to describe any closed container used to transport commodities or cargos. The commodities or cargos transported come in direct contact with the container interior, which is cleaned by TEC facilities. Examples of containers which are considered tanks include but are not limited to: tank trucks, closed-top hopper trucks, intermodal tank containers, rail tank cars, closed-top hopper rail cars, inland tank barges, closed-top inland hopper barges, ocean/sea tankers, and similar tanks (excluding drums and intermediate bulk containers). Containers used to transport pre-packaged materials are not considered tanks, nor are 55-gallon drums or pails.

Tank Truck - A motor-driven vehicle with a completely enclosed storage vessel used to transport liquid, solid or gaseous materials over roads and highways. The storage vessel or tank may be detachable, as with tank trailers, or permanently attached. The commodities or cargos transported come in direct contact with the tank interior. A tank truck may have one or more storage compartments. There are no maximum or minimum vessel or tank volumes. Tank trucks are also commonly referred to as cargo tanks or tankers.

TECI - Transportation Equipment Cleaning Industry.

Total Annualized Cost - The sum of annualized total capital investment and O&M costs. Total capital investment costs are annualized by spreading them over the life of the project. These annualized costs are then added to the annual O&M costs.

Total Capital Investment - Total one-time capital costs required to build a treatment system (i.e., sum of direct and indirect capital costs).

Totes or Tote Bins - A completely enclosed storage vessel used to hold liquid, solid, or gaseous commodities or cargos which come in direct contact with the vessel interior. Totes may be loaded onto flat beds for either truck or rail transport, or onto ship decks for water transport. There are no maximum or minimum values for tote volumes, although larger containers are generally considered to be intermodal tank containers. Totes or tote bins are also referred to as intermediate bulk containers or IBCs. Fifty-five gallon drums and pails are not considered totes or tote bins.

TPH - Total petroleum hydrocarbons. A method-defined parameter that measures the presence of mineral oils that are extractable in Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane) and not adsorbed by silica gel. The analytical method for TPH and Oil and Grease is currently being revised to allow for the use of normal hexane in place of Freon 113, a chlorofluorocarbon (CFC). Method 1664 (Hexane Extractable Material) will replace the current Oil and Grease Method 413.1 found in 40 CFR 136. In anticipation of promulgation of Method 1664, data collected by EPA in support of the TECI effluent guideline utilized Method 1664. Therefore, all effluent limitations proposed for Oil and Grease and TPH in this effluent guideline are to be measured by Method 1664.

Transportation Equipment Cleaning Facility - Any facility that generates wastewater from cleaning the interior of tank trucks, closed-top hopper trucks, rail tank cars, closed-top hopper rail cars, intermodal tank containers, inland tank barges, closed-top hopper barges, ocean/sea tankers, and other similar tanks (excluding drums and intermediate bulk containers).

Transportation Equipment Cleaning Wastewater - Washwaters which have come into direct contact with the tank or container interior including prerinse cleaning solutions, chemical cleaning solutions, and final rinse solutions. In addition, wastewater generated from washing vehicle exteriors and equipment and floor washings for those facilities are covered by the proposed guidelines.

Treatment Effectiveness Concentration - Treated effluent pollutant concentration that can be achieved by each treatment technology that is part of a TECI regulatory option.

Treatment, Storage, and Disposal Facility (TSDF) - A facility that treats, stores, or disposes hazardous waste in compliance with the applicable standards and permit requirements set forth in 40 CFR Parts 264, 265, 266, and 270.

TSS - Total suspended solids. A measure of the amount of particulate matter that is suspended in a water sample. The measure is obtained by filtering a water sample of known volume. The particulate material retained on the filter is then dried and weighed, see Method 160.2.

Untreated Loadings - Pollutant loadings in raw TEC wastewater. These loadings represent pollutant loadings generated by the TECI, and do no account for wastewater treatment currently in place at TEC facilities.

U.S.C. - The United States Code.

Zero discharge facility - A facility that does not discharge pollutants to waters of the United States or to a POTW. Also included in this definition are discharge or disposal of pollutants by way of evaporation, deep-well injection, off-site transfer to a treatment facility, and land application.